Enea uCPE Solution Review

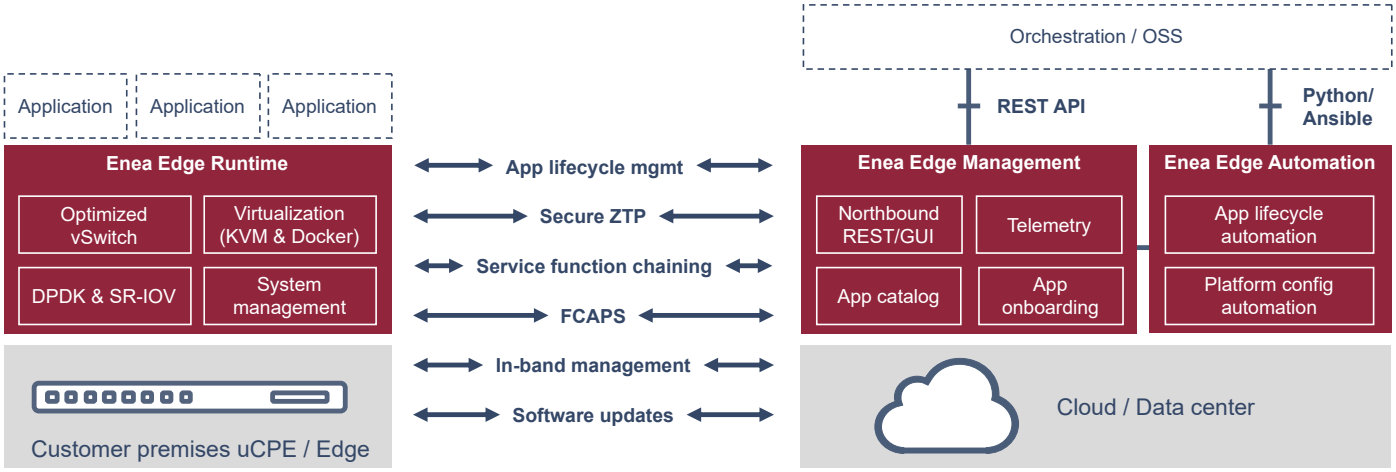
Introduction

Founded in 1968 by four engineers from Sweden's Royal Institute of Technology, Enea is a technology company with an illustrious history. Its first product was an operating system (OS) for a military computer used by the Swedish Air Force, and it was the proud recipient of Sweden's first e-mail sent over the internet in 1983. Fast forward to today and Enea is now an established supplier of software for telecommunications and cybersecurity with over 700 employees spread across APAC, EMEA and the Americas. Backed by ongoing heavy investment in R&D (28% of revenue), Enea's broad portfolio of solutions power telecom and enterprise services that serve more than 3 billion people globally.

As part of its product portfolio, Enea offers a uCPE solution comprising:

- Enea Edge Runtime — a white box operating system for virtual machines and containers.
- Enea Edge Management — cloud-based end-to-end management.
- Enea Edge Automation — a framework for automating deployment and operation of large-scale networks

Together they form **Enea Edge**, a streamlined platform that transforms white box uCPEs into a managed enterprise edge solution.



As part of this research brief, the sponsor of the brief, Enea, requested that AvidThink provide an independent review of their solution as it pertains to the topic of the research brief. AvidThink conducted this review using the information provided by the sponsor and AvidThink's own market research on SD-WAN and edge computing. AvidThink has not verified all features and capabilities of the product. Readers interested in the solution under review should ascertain the veracity of vendor claims. AvidThink cannot be held liable for the unexpected operation, damages, or incorrect operation due to any inaccuracies listed here.

Enea Edge

Enea Edge Runtime is a uCPE operating system that utilizes Linux KVM for virtualization and Docker Containers. It takes up less than 1GB of RAM and disk footprint and can run on a single CPU core. Unlike other uCPE OS solutions, Enea Edge Runtime does not depend on the use of the OpenStack virtualization infrastructure manager. Early operator feedback suggested that the use of OpenStack could result in high overhead for small form-factor deployments, such as uCPE. Instead, Enea leverages NETCONF as a management protocol. Should customers require OpenStack compatibility at remote premises, Enea Edge Runtime also provides the option to run containerized OpenStack on its platform.

Hardware Agnosticism

Enea focuses on providing a software-only solution that supports SD-WANs and other NFV/CNF applications from multiple vendors. It does not sell hardware platforms, taking instead an independent approach that is agnostic to the underlying hardware. By working with white box manufacturers providing both x86 and Arm-based platforms in a variety of scaled configurations, Enea is able to maximize performance from hardware resources by providing acceleration via the use of DPDK and SR-IOV. Enea Edge Runtime has been benchmarked at sustaining 10Gbps throughput while only adding between 10-15µs latency on its vSwitch.

As discussed in the main research brief, focusing CSPs on software value-add fosters the right mindset for building out disaggregated edge solutions and can reduce the risk of lock-in. In that light, Enea's software-only approach aligns with our recommendations.

Orchestration Integration

In the research brief, we also discussed the importance of tight orchestration with carrier OSS. Enea Edge Automation provides a RESTful northbound API, and the company has demonstrated ease of integration with a variety of carrier and enterprise orchestration systems.

Enea have made clear that their role is in the management of edge nodes and working with other orchestration systems. While they don't claim multilayer, multiservice orchestration, Enea Edge Management has proven itself capable of managing multiple thousands of edge nodes for enterprises running SD-WAN and other workloads. Meanwhile, Enea Edge Management can integrate with advanced orchestration systems as part of a more complex service offering at service providers.

Enea's integrated solution enables quick rollout with zero-touch provisioning and can feed telemetry into a carrier OSS. The end result is faster deployment, automated monitoring and improved fault management.

Automation Support

Enea's use of RESTful northbound and standards-based NETCONF southbound for its uCPE platform and the availability of Enea Edge Automation makes it easy to integrate into carrier or enterprise automation initiatives. For instance, many of Enea's customers today depend on automation platforms like Ansible from Red Hat/IBM. Ansible playbooks and other similar automation blueprints can utilize Enea Edge's REST-based APIs to control all aspects of Enea Edge operations. This can help avoid unnecessary manual interventions, reducing associated errors and lowering operational expenditure. Enea Edge Automation can improve time to market, allowing carriers and enterprises to respond quickly and scale rapidly to meet market demands.

Prevalidated Solutions

We found that one of the CSPs' common concerns around disaggregated uCPE is integration complexity and platform validation. CSPs want the benefit of uCPEs and white box platforms, but prefer not to play the role of system integrator doing

interoperability testing in their labs. Instead, they seek integrated or prevalidated solutions that provide faster time to market and less troubleshooting in the field.

Enea has a wide ecosystem of VNF and CNF partners that have tested their solutions on Enea Edge Runtime. To ensure that solutions work smoothly in real-world, end-to-end deployments, Enea performs integration testing on certified hardware platforms and with orchestration system partners.

We believe that Enea's prevalidated approach with their preferred solution partners will put them in a favorable light at CSPs.

Ecosystem Breadth

Enea indicates that they have onboarded a significant number of partners across hardware platforms and orchestration vendors as well as SD-WAN and other VNF providers. This confirms the value of Enea's partner integration program to validate interoperability and benchmark performance prior to deployments at customer sites.

Examples of Enea's wide range of ecosystem partners are shown in the diagram below (provided by Enea):

SD-WAN/SASE and Beyond

Enea's rich ecosystem illustrated above provides their customers with multiple options on VNF selections. They've partnered with numerous SD-WAN/SASE solutions popular amongst service providers. And their embrace of both KVM and Docker provides the option to support both VNFs and CNFs, allowing greater compatibility with a range of solution providers.

Interestingly, a few of Enea's SD-WAN/SASE partners provide their own integrated greybox solutions[1]. Enea argues that the greybox approach does not provide true vendor agnosticism. We agree that CSPs buying into a greybox approach could be locked into a single SD-WAN solution, without an open path to multivendor edge offerings.

[1] A greybox strategy involves vendors integrating their software into mainly commodity off-the-shelf platforms and selling the integrated appliance as a product. These platforms may have proprietary modifications like the use of hardware accelerated NICs or ASICs.

As we indicated in the research brief, carriers are expanding their uCPE strategy into edge computing. Beyond SD-WAN/SASE functions, service providers want to support enterprises running their own application workloads on uCPE platforms. CSPs are also hoping to increase revenue opportunity by providing other non-SD-WAN functions on these uCPE platforms.

Enea Edge supports this evolution into multifunction edge computing. Enea has shared with us that they are seeing early use cases around IoT gateways, private LTE and 5G networks, managed Wi-Fi, and video surveillance and computer vision. For instance, enterprises could run parts or all of a private LTE/5G mobile core on the uCPE on premises. In particular, the uCPE approach aligns with disaggregated open RAN initiatives gaining momentum, where centralized unit (CU) and even distributed unit (DU) components could be hosted on a uCPE, perhaps with hardware acceleration.

Enea's observations aligns with our own research, and we believe that the uCPE platform can play the role of an edge computing foundation in many enterprise deployments — particularly in enterprise branch locations.

Conclusion

Enea Edge is a pure-play uCPE OS and management platform that benefits from their hardware and orchestration agnosticism. It places them in a strong position of neutrality as CSPs seek lock-in-free uCPE strategies. Enea's low-footprint runtime, support for both x86 and Arm architectures and compatibility with a range of small to large white box platforms, allows CSPs to balance costs and performance as they strive to serve diverse enterprise workloads. Further, by demonstrating compatibility with multiple service provider OSS and embracing a wide ecosystem of VNF and CNF partners, Enea Edge can be a strong platform for carriers looking for an on-premises SD-WAN platform that can grow into a fully-fledged on-premises edge solution.