Virtual cable modem termination system for cable operators

Based on HPE Edgeline EL4000 Converged Edge System
The demand for media bandwidth is voracious today, as subscribers are no longer satisfied with basic video and data services. They now expect high-definition television (HDTV) programming, video on demand (VoD), and more than 100 Mbps speed for data services.

Currently, this is causing challenges for cable operators, as this requires enormous bandwidth and increased capacity of the infrastructure layer. Cable operators need a strategy that incorporates their existing investments to cost-effectively meet users’ expectations and at the same time meet business operation requirements.

Therein lies scaling-through virtualization, which is bound to change the cable industry.

The idea is to move services, like video transcoding and packaging, CMTS and such, from purpose-built appliances to software running on cable operator terminal system in a virtualized environment.

**Business challenge**

Since the very beginning cable operators have deployed CMTS in a nonvirtualized way, with CMTS components implemented as purpose-built hardware appliances. The hardware and software are closely integrated. This brings some business challenges:

- Upgrading system functionality, expanding system capacity, or changing system architecture always comes down to a long cycle of manipulating the hardware appliances.
- Upgrading the appliance may require the entire CMTS to be taken offline including all subscribers, which impacts the end users.
- Vendor lock-in, associated with purchase of such specialized appliance, as it is specific to that application and could potentially become obsolete or run out of capacity due to subscriber demand.
- Upgrades imply replacing the appliance with a new model, which means additional costs.

Furthermore, the traditional CMTS architecture is monolithic and not enough flexible; it generates immense heat, draws substantial power, and has many points of failure. The following diagram illustrates how a CMTS appliance fits into the cable operator’s architecture.

![Traditional architecture of CMTS appliance](image-url)
Solution for cable operators

Cable operators have recognized the potential of CMTS virtualization. The concept is simple: virtualized CMTS software runs on high-performance, general-purpose compute hardware, HPE Edgeline EL4000.

There are many obvious benefits:

• Given the small form factor (1U) of HPE Edgeline EL4000, there is a significant savings in headend rack space.

• Substantial savings on power and cooling.

• Scalability with independent software and hardware scaling as well as uniform hardware scaling (to add more service groups or capacity you simply add another system).

• Similar concept for redundancy.

• New flexible architectures, where CMTS functionality can be pushed out of headend closer to the network edge, therefore giving flexibility between cable network and optical IP backhaul.

Furthermore, virtualization in headend enables new synergies between functional components.

The same hardware platform can be used to host many virtualized functions otherwise implemented as purpose-built appliances (for example, CCAP, video transcoders/packagers, video on demand origin/cache, and such, running on the same HPE Edgeline EL4000 platform and virtual functions) as shown in Figure 2.

HPE Edgeline solution overview

To enable virtual cable functions and services at the edge, HPE has created a platform that is dense, ruggedized, and scalable for the specific needs of the network edge. HPE Edgeline EL4000 Converged Edge System is based on powerful Intel® x86 compute, and it is designed to address specific challenges of cable network edge environment, by providing scalable compute, storage, and networking resources at edge locations.

Figure 2. Virtual CMTS architecture based on HPE Edgeline EL4000

Figure 3. HPE Edgeline EL4000 Converged Edge System with Intel® Xeon® compute for network edge deployments
HPE Edgeline EL4000 system hosts up to four hot-swappable server cartridges in 1U chassis, providing up to 64 Intel Xeon D cores with optimized price per/core and watt per/core characteristics. That design provides up to three times higher compute density than a typical data center component while reducing power consumption. Also, the environmental hardened characteristics allow cable operators to place HPE Edgeline EL4000 system at the deepest edge of access network, where space and power constraints make other general-purpose compute platforms not suitable.

Some use cases require different types of compute resources. HPE Edgeline EL4000 platform provides diverse compute and hardware acceleration capabilities, allowing to collocate workloads in the same chassis with different compute needs.

- General workloads—Intel x86 processors (for example, virtual functions like vCMTS, vCCAP, vQAM functions).
- Built-in GPU to accelerate graphics processing.
- Dedicated GPU to accelerate deep learning algorithms (for example, video transcoding, machine learning inference at the edge for subscriber analytics, and such).
- Cryptographic acceleration through Intel QuickAssist Technology.
- PCIe extension slots—Up to four for specialized plug-in units such as dedicated FPGA boards, neuromorphic chips, and such.

The modular design of HPE Edgeline EL4000 is perfect for failover cluster size in terms of number of supported service groups per cartridge. HPE Edgeline EL4000 enables efficient migration of CCAP/CMTS from proprietary hardware platforms to COTS-based and software-based solution. Software-based CMTS can run as an application on the HPE Edgeline EL4000, enabling next-generation software-defined architecture for cable operators with IT-grade economics for cable infrastructure.

Summary

The cable industry is embarking on a new era with increased demand for consumer entertainment and advertising. The success will depend on increasing revenues and controlling costs through innovative approaches to establishing a content-centric operating model that supports flexibility at low cost while optimizing the consumer experience. HPE Edgeline EL4000 Converged Edge System enables the deployment of scalable software services that permit cable operators to be flexible and grow as and when the industry demands.

Learn more at hpe.com/info/edgeline