

Harmonic vCMTS Enables Greener Gigabit Broadband & Lowers TCO

The Harmonic CableOS® solution and Intel® Xeon® processors empower cable operators to deliver a superior subscriber experience at a 40 percent lower cost¹



Consumer demand and market shifts create new challenges for MSOs

Today's consumer is online, all the time. We are constantly connected. Consumer demand for increased broadband speeds and improved connectivity only continues to accelerate. It's no surprise considering the wide variety of screen options available, including mobile phones, tablets, and televisions, which in turn fosters a growing list of video streaming services with seemingly endless content choices. Industry estimates have found that video accounts for more than 60 percent of internet traffic.² Internet traffic has been even further impacted in 2020, and it's very likely that the changes are here to stay. The global health crisis has forced increased video conferencing for work, remote learning and virtual classrooms, and social interactions, and shelter-in-place mandates have resulted in a surge in video content streaming: screen time for almost all age groups increased by 31 percent during this time.³ Broadband connectivity demand shows no sign of slowing and the pressure on multi-system operators (MSOs) to provide those services is mounting.

The increased demand for video represents a changing landscape for MSOs. Many consumers are now turning to internet streaming services over cable television infrastructure to stream all types of bandwidth-intensive video content on any device, from anywhere. How can MSOs provide faster, more reliable broadband services, including video streaming to subscribers, and still reduce operating costs? This paper will present the benefits and a cost analysis of a virtualized cable modem termination system (CMTS) deployed in a distributed access architecture (DAA). It will present examples from the field and provide insights into the real value of software-based infrastructures and a virtualized CMTS.

The traditional CMTS is not sustainable

MSOs have long relied on CMTS hardware located in the headend facility to provision broadband data services. This architecture has served MSOs well for the past 20 years. And until just a few years ago, a neighborhood with 500 homes could be served by a single CMTS downstream port and an upstream port connected to a fiber node. Although, as higher bandwidth services were deployed, the existing headend facilities lacked the expansion capacity to meet demands. MSOs needed to then divide that service group to serve 250 or fewer homes, add another fiber node, and activate another pair of CMTS ports for downstream and upstream traffic. Based on current and projected growth in demand, expansion with this service delivery platform is just not sustainable.

Leading the cable access industry with vCMTS to enable MSOs to adapt to market demand

Intel® Network Builders ecosystem partner Harmonic has built a virtualized CMTS (vCMTS) platform that allows MSOs to run workloads on Intel® Xeon® Scalable processors. Harmonic is a market leader in the cable access industry and pioneered vCMTS. Its products evolve the status quo and prove that it is possible to move away from a fixed-function CMTS hardware to improve network performance cost-effectively. Harmonic's CableOS® solution utilizes less energy and requires less space than legacy hardware. It's a solution that scales to meet customer demand for superior quality of experience for delivering next-generation video and voice services with high-speed data.

A network that can adapt and scale as the MSO's business grows is essential. A future-ready solution that can evolve and upgrade overnight, with lower costs, will make dramatic impacts to the bottom line for MSOs. To achieve this, MSOs should look to transition from a hardware-based CMTS to a vCMTS. A vCMTS moves everything but the physical layer of the access network to software, offering greater agility and flexibility to meet ever-growing consumer demand for more bandwidth.

The solution that more MSOs are choosing, worldwide

The CableOS solution provides a cloud-native, virtualized CMTS and includes PHY options for centralized access architectures (CAA) or remote PHY (R-PHY) for DAA. The DAA separates the CMTS functions and distributes some of those functions closer to the subscriber by using R-PHY. Moving the physical layer processing to the fiber node at the network edge alleviates typical hardware constraints like rack space, cooling, and power requirements in the headend facility, as well as associated costs.

The CableOS solution currently has the largest industry footprint for DAA deployments with some of the industry's biggest operators. It provides MSOs a cost-effective way

to deliver cutting-edge internet and video services with a greener, more economical solution that is designed for the long term.

Intel technology and the CableOS solution make a powerful combination for network transformation

CableOS vCMTS software can be deployed on Intel® architecture-based commercial off-the-shelf servers (COTS), or as a cloud-native application delivered via a cloud data center at a fraction of the cost of traditional fixed-function CMTS hardware. CableOS R-PHY devices integrate into a dense PHY shelf or node to deliver high-speed video, data, and voice services over coax. The R-PHY devices also provide legacy hybrid fiber-coaxial (HFC) in a DAA with full RF spectrum coverage.

The high-performance vCMTS software integrates full DOCSIS functionality. The software features an advanced core routing engine (CRE) that enables 1+1 high availability and is expandable to support incremental 10 G links to RPDs, 100 G links to the edge router, or backbone network.

Analyzing the real cost of ownership of vCMTS deployed in a DAA

With a truly virtual cable access solution, everything but the physical layer of the access network is integrated in the software. A virtualized CMTS has a more flexible architecture that results in lower costs to operate and manage the network. By disaggregating modular software components, MSOs can scale and deploy feature upgrades and can add symmetric or multi-gigabit services, without having to replace or purchase additional hardware.

The total cost of ownership (TCO) shown in Table 1 compares the average costs associated with a legacy CMTS versus the significantly reduced costs of implementing Harmonic's CableOS solution with vCMTS and R-PHY in a DAA. The chart also shows the total savings achieved by moving to the software.

	Legacy	CableOS R-PHY	Savings
Facility	\$ 8,671,578	\$ 525,550	\$ 8,146,028
Optics	\$ 12,887,344	\$ 2,062,500	\$ 10,824,844
Node	\$ 8,437,500	\$ 15,000,000	-\$ 6,562,500
CMTS	\$ 19,687,500	\$ 11,620,926	\$ 8,066,574
DOCSIS License for expansion	\$ 24,634,500	\$ -	\$ 24,634,500
Total Project Costs	\$ 74,318,422	\$ 29,208,977	\$ 45,109,445

Table 1. TCO for legacy CMTS vs vCMTS networks.

The TCO above represents a network buildout that services 1.5 million subscribers. In the legacy setup, there are 400 subscribers per service group for a total of 3,750 service groups and approximately 19 service groups per rack. As shown, the cost for this legacy setup can be significant. Facility

costs include real estate, power and backup generators, electrical, and HVAC. Then there is the cost of optics, including the chassis, fiber management, power supplies, and other related equipment. And of course, there are costs for nodes, CMTS software, and DOCSIS licensing for expansion.

With the Harmonic CableOS solution deployed with R-PHY in DAA, the MSO is able to reduce the number of equipment racks from 198 racks in the legacy setup to just 12 racks. Additional OPEX savings are achieved with the CableOS R-PHY solution and include the hub collapse, as well as savings on annual facility and maintenance costs. This takes into account property taxes, cable management, equipment maintenance, and headend manpower. The MSO also saves on support costs for old gear that is now able to be removed.

The CableOS solution reduces overall energy requirements, allowing MSOs to sustainably expand capacity and scale simply, without worrying about real estate concerns each time an upgrade is needed.

Given these network parameters, the Harmonic CableOS vCMTS solution can save the MSO a significant amount of capital expense compared to a legacy solution. This is especially apparent with regard to facilities, optics, nodes, and licensing for the CMTS and DOCSIS. Given the numbers above, the TCO of the CableOS solution with R-PHY costs 40 percent less compared to the same network from a legacy CMTS vendor.

Deploy vCMTS in a Distributed Access Architecture (DAA) to improve scalability and alleviate hardware constraints

Legacy CMTS are traditionally deployed in central access architectures (CAA), where the main functions of the CMTS all reside in the headend facility. As mentioned previously, that can create crowding in the headend facility, and limit capacity expansion. Distributed access architectures (DAA) contribute to resolving this cost-intensive issue.

Although it is possible to implement DAA in legacy hardware CMTS, this model may still suffer from slow development cycles, heavy power consumption, and massive space inefficiency. Implementing a vCMTS will allow MSOs to truly achieve the powerful advantages of DAA.

The long-term advantage of virtualized software solutions for CMTS that are deployed in DAA is scalability. It offers more flexibility regarding the location of the various CMTS components and how to scale each component individually, based on actual needs. A legacy CMTS can be as large as a 13RU-high chassis. An entire new chassis may even be

“The MSO reduced the racks from 198 in the legacy setup to just 12 ”

needed just to add one single component, such as additional RF ports. With a virtualized CMTS, you benefit from disaggregation to add only what you need, whether it is an RF port or additional processing.

vCMTS overcomes the legacy CMTS hardware-bound limitations that make upgrading the network expensive and time-consuming. Without virtualization, the development cycle for network performance upgrades is extremely long and expensive, given the high costs of custom-made hardware needed to meet service level agreements (SLAs).

Lower costs of operation: More savings for your business

Additional advantages of virtualization and software-based solutions goes beyond hardware. A virtualized solution enables cloud-connected management services. The CableOS solution provides MSOs easy-to-use tools and non-stop global support from a dedicated Harmonic network operations center (NOC). These cloud-enabled services ensure a certain number of operational benefits:

- Automation of routine tasks to streamline operations and enhance monitoring capabilities.
- Unprecedented visibility into the network for faster response time and proactive issue prevention.
- Improved network performance to deliver a superior broadband experience to reduce calls to support and lower churn.



Unprecedented rack reduction: A field example of how going green generates massive savings

In another MSO example (see Figure 1), the legacy network setup had five racks of equipment to service 96 service groups. With the Harmonic CableOS solution, the MSO was able to provide service to 192 service groups in a single rack of equipment. In addition to the space, power, cooling, and cost savings, the MSO was able to significantly reduce the time it takes to identify network problems and reduced the time required to carry out upgrades.

Essential takeaway for every MSO: You can deliver superior subscriber experiences at a lower cost of ownership

The ability to meet demand for increased broadband connectivity and faster speeds will reduce churn and foster business growth. MSO networks cannot achieve that success with traditional architectures. To adapt and prepare for long-term efficiency, MSOs must evolve and keep pace with this consumer demand. vCMTS solutions solve the MSO's challenges for increasing network capacity while meeting cost, performance, and scalability objectives. These realities are even more impactful in relation to deployment speed and related deployment costs.

“Provide service to 192 service groups with a single rack with the CableOS solution.”

Harmonic's CableOS solution with vCMTS and R-PHY enables MSOs to benefit from cost reductions linked to virtualizing the CMTS. It will provide continuous bandwidth improvements and handle capacity expansion without the left linked to legacy hardware to lower costs related to space, power, cooling, cabling, and everything else that makes legacy hardware inadequate today. By partnering with Intel and Harmonic, MSOs can implement vCMTS solutions that deliver superior quality of experience and improve TCO for a smarter, greener, and more agile broadband network.



Legacy: Pod = 96 service groups
5 Racks



Next Gen: Pod = 192 service groups
1 Rack

Figure 1. Rack space comparison of legacy CMTS and vCMTS solutions.

Powered by Intel® Xeon® Scalable processors

Harmonic's CableOS solution is optimized for servers utilizing 2nd generation Intel® Xeon® Scalable processors. The Intel processors provide the foundation for powerful data center and network edge platforms delivering both agility and scalability. This innovative processor platform converges capabilities across compute, storage, memory, network, and security.

The Intel Xeon Scalable platform is designed for MSO networks to modernize for operational efficiencies that lead to improved total cost of ownership (TCO). Systems running on the Intel Xeon Scalable processor family are designed to deliver agile services with enhanced performance and capabilities.

Learn More

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Notices & Disclaimers

¹ Data provided by Harmonic, September 2020. See Table 1 for calculations.

² <https://www.ncta.com/whats-new/report-where-does-the-majority-of-internet-traffic-come>

³ <https://www.ofcom.org.uk/about-ofcom/latest/features-and-news/lockdown-leads-to-surge-in-tv-screen-time-and-streaming>

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