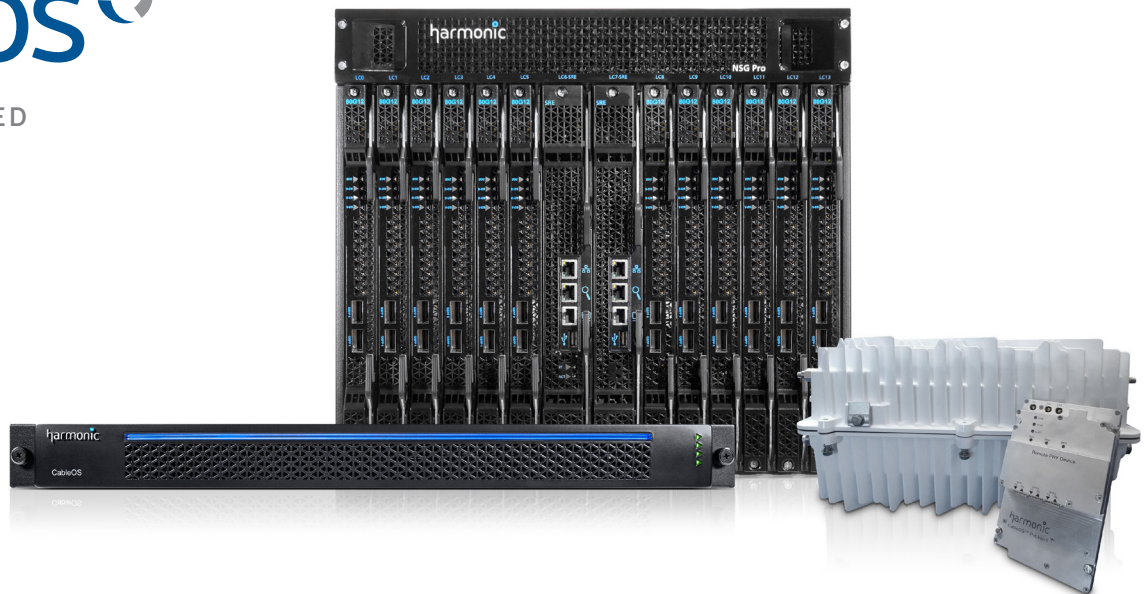


cableOS

SOFTWARE-BASED
CCAP SOLUTION



Demand continues to grow exponentially for high-speed broadband services such as OTT streaming, video on demand, time-shift TV and cloud DVR. Adding these capabilities is essential to a cable operator's top-line growth, but the high cost of power and cooling can eat away at the bottom line. It can also take months to launch new services, due to the need to add equipment and capacity in order to support these new IP-based offerings. To better compete, cable operators need a simpler, faster way to add capacity. Their cable access networks must also be as efficient as possible to reduce costs and simplify future upgrades.

The Harmonic CableOS™ software-based Converged Cable Access Platform (CCAP) delivers on all fronts. Featuring the industry's first software-based Cable Modem Termination System (CMTS) running on off-the-shelf, 1-RU Intel® servers, the first end-to-end Remote PHY system, and leading RF port density, CableOS provides cable operators with unprecedented scalability, agility and cost savings.

Flexible and future-proof, CableOS enables the migration to multi-gigabit broadband capacity and the fast deployment of DOCSIS 3.1 data, video and voice services. Legacy capabilities such as out-of-band (OOB), leakage detection and FM radio are also supported. The solution is built from the ground up to solve the real-world challenges of cable operators, and can be deployed as a centralized, distributed or hybrid architecture. In any deployment CableOS resolves space and power constraints in the headend and hub, eliminates dependence on hardware upgrade cycles, and reduces TCO. With its multi-dimensional scalability, CableOS even allows operators to cost-effectively grow from supporting a few service groups to more than a hundred simply by adding 1-RU servers.

Multiple use cases are supported with CableOS, including:

- The migration to a software and NFV-based cable access architecture
- The migration to a deep fiber or digital fiber architecture
- The deployment of gigabit service
- The reduction of space and power consumption in existing facilities through function integration
- The reclamation of equipment from small remote hubs to a centralized facility
- The support of any size operation, from the smallest to the very largest

HIGHLIGHTS

- Sustainable capacity growth over the long term
- Supports fast deployment of new IP-based data, video and voice services
- Easily scales from a small deployment to 100+ service groups
- End-to-end support for centralized and distributed architectures
- Supports legacy services such as OOB, leakage detection and telemetry
- Extends the life of the cable access network with digital fiber and better coax spectral efficiency
- Enables the migration to multi-gigabit broadband capacity
- Leverages latest technology innovations, including full-spectrum DOCSIS 3.1 and NVF
- Provides high availability
- Resolves space and power constraints in the headend and hub
- Eliminates the need for hardware upgrade cycles
- Supports a broad range of encryption solutions

CableOS saves up to 75% on space and power costs in a centralized deployment, and up to 90% in a distributed deployment.

More Capacity in Less Space

The transition to online video consumption and managed video services, as well as the deployment of higher resolution video such as Ultra HD and new data applications such as the Internet of Things (IoT), will drive the need for increased broadband capacity well into the future. Competition from service providers delivering fiber to the home (FTTH) further challenges cable operators to offer ever higher service speeds. Adding new service groups can help meet this demand, but space and power requirements in the headend are finite, making the ongoing addition of new capacity unsustainable.

CableOS allows cable operators to achieve multi-gigabit broadband capacity while simultaneously lowering their space and power requirements. In a centralized CCAP deployment, operators can save up to 75% on space and power costs, while a distributed deployment saves up to 90%. In contrast, a hardware-based CCAP typically requires nine racks of equipment to support 80 service groups; with CableOS, more than 250 service groups can be supported in just four racks – a 7x density difference! The result is a lower-cost cable access architecture that delivers significant CAPEX savings while allowing faster, simplified deployment of new subscriber services.

Greater Agility for Improved Feature Velocity

As a software-based solution, CableOS leverages the Intel x86 technology curve to provide the advantages associated with IT economics and Moore's Law. Operators no longer need to purchase space-consuming and expensive hardware-based CMTS platforms, and can break away from the cycle of needing to upgrade hardware every three years to accommodate capacity growth requirements. With CableOS, regular software upgrades accelerate the introduction of high-layer DOCSIS 3.1 capabilities, and capacity is gained simply by adding new 1-RU servers. CableOS also aligns with industry virtualization initiatives, enabling greater operational elasticity and orchestration.

End-to-End Remote PHY Solution

For cable operators seeking to deploy a fiber-deep network that can support both IP and legacy capabilities, CableOS helps simplify the migration. The solution complies with CableLabs® R-PHY standards to provide a common method of connectivity from CableOS Core servers to Remote PHY devices (RPDs), assuring full RF spectrum coverage and extending network capacity. A full-featured tool set for downstream/upstream spectrum monitoring and support for DOCSIS 3.1 proactive network maintenance (PNM) add operational efficiency. In addition to the space and power savings associated with moving RF components out of the headend and into the field, decoupling the CCAP Core from the PHY in a Remote PHY architecture leverages the benefits of digital fiber, such as signal transport over much longer distances and more wavelengths.

World-Class Service & Support

With thousands of successful installations, Harmonic possesses unique, extensive knowledge of the cable access environment and unsurpassed expertise. Our technical support and field engineers possess decades of collective experience in the cable industry and have the ability to go far beyond optimal deployment strategies and troubleshooting. The Harmonic Global Service and Support organization also understands the intricacies of every ancillary system touched by the access network, from back-office video control planes to IP backbones, assuring that the installation of and cut-over to a CableOS solution exceeds every customer expectation.



CableOS Core software, which runs all CMTS functions, runs on an off-the-shelf 1-RU server.

Solution Components

The Harmonic CableOS CCAP features a comprehensive suite of products that work together to deliver data, video and voice services over existing cable access network infrastructure. At the heart of the solution is the CMTS Core, a single logical entity composed of a cluster of COTS servers and L3 switches. Unlike a traditional CMTS, these elements are not bound to a single chassis. The server cluster performs all DOCSIS functionality (e.g., MULPI, OSSl) not present in the RPDs, and the L3 switches provide aggregation and routing capabilities.

Whether deployed in a centralized or Remote PHY architecture, the CableOS solution delivers breakthrough RF port density, boundless scalability and high availability. A wide array of video encryption solutions, including PowerKey Encryption (PKE) and Universal DTA (uDTA), are supported.

CableOS Core CMTS Software

Harmonic's CableOS Core CMTS software runs on 1-RU Intel x86 servers. It performs all CMTS functions, including common control, management and forwarding of IP traffic across the cable access network. The high-performance software is capable of processing tens of gigs of capacity per rack unit. All DOCSIS-related applications, such as DSG and PacketCable, are supported, as are IPv4 and IPv6 services.

NSG™ Pro Cable Access Platform

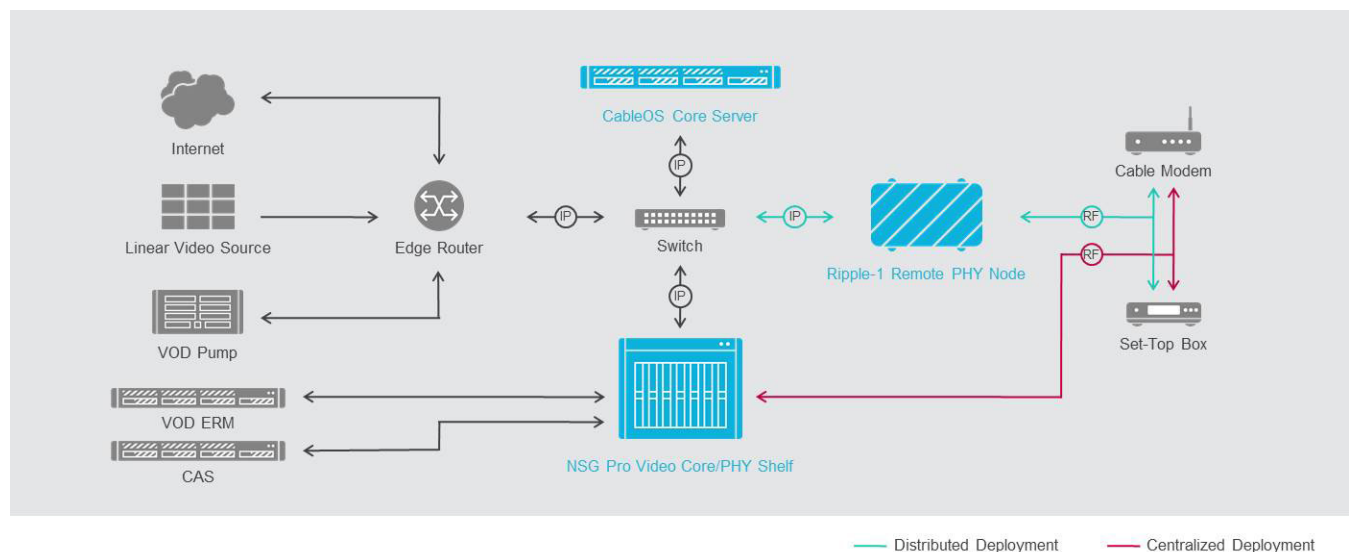
NSG Pro is Harmonic's versatile CCAP-compliant universal edgeQAM that, with the addition of 80G-12 line cards, serves as a PHY shelf in a centralized CableOS deployment, or, with the addition of 20G-IP line cards, as the video core in a distributed deployment. Possessing ultra-high density and advanced function integration capabilities, including the ability to converge linear video, VOD and data onto a single 9-RU system, NSG Pro provides operational efficiency and reduces power consumption and cooling requirements to minimize TCO.

CableOS Ripple-1 Remote PHY Node

Compact and cost-effective, the CableOS Ripple-1 Remote Phy node (RPN) is a hardened outdoor enclosure for networks tasked with delivering video, data and voice services over coax. It is designed to house the Pebble-1 Remote PHY device (RPD), and also features an integrated RF launch amplifier that provides superior RF performance and built-in remote configuration functionality. Multiple configurations of the RPN using one or two Pebble-1 RPDs are available.

CableOS Pebble-1 Remote PHY Device

The CableOS Pebble-1 RPD supports full-spectrum DOCSIS 3.1 specifications with superior performance at high output power. The RPD interfaces with CableOS Core software to move an operator's RF requirements out of the headend or hub and place them deep in the fiber network, simplifying headend design and operation to resolve space and power constraints, lower capital and operational expenses, and provide service flexibility. Pebble-1 RPDs can be installed in a Ripple-1 RPN or with select third-party outdoor enclosures.



Centralized and Remote PHY architectures are both available with CableOS.