NSG™ Exo

Distributed CCAP System

HIGHLIGHTS

- Delivery of video, voice and data from a single deep-fiber device
- CCAP-ready: DOCSIS/EuroDOCSIS/ J-DOCSIS CMTS and universal edgeQAM (future) capabilities
- Gbps throughput via GigE, GPON or EPON network interface
- 960 Mbps downstream/160 Mbps upstream
- 16 Annex-A or Annex-B downstream channels/4 upstream channels
- Downstream and upstream channel bonding with partial service support
- Superior RF performance
- Supports up to 250 subscribers per device
- Harmonic CableOS
- Indoor and outdoor enclosure options

A distributed architecture, cost-effective CCAP device enabling voice, video and data services to coax-rich buildings, campuses and facilities

The Harmonic NSG™ Exo distributed CCAP system is a high-performance cable edge device for the delivery of video, data and voice services over coax. Compact and cost-effective, NSG Exo moves a service provider's RF requirements out of the headend or hub and places 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.

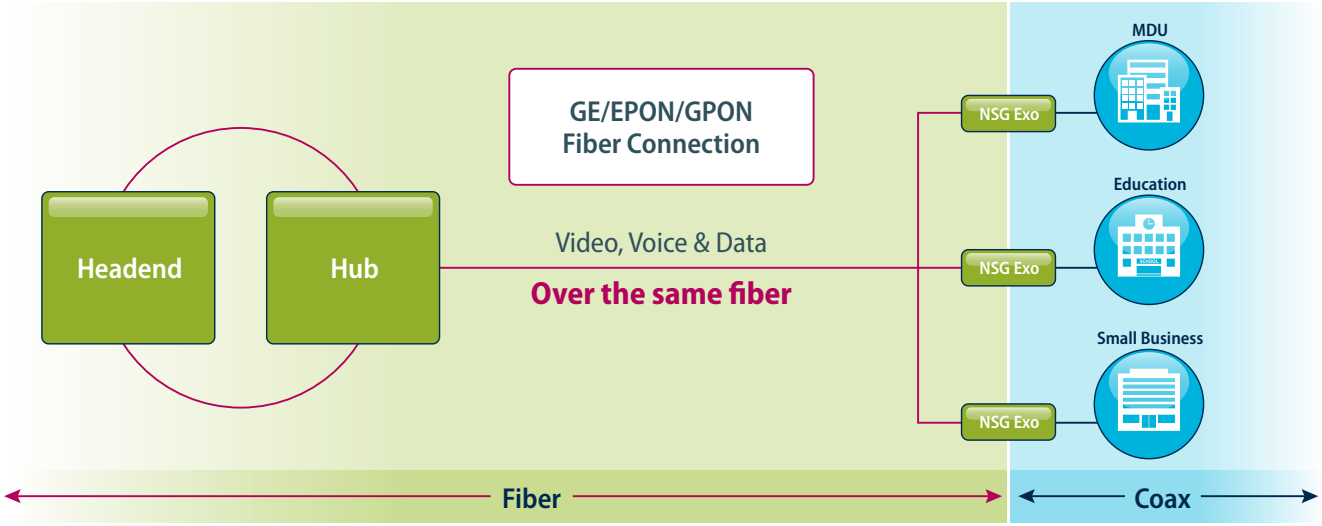
BENEFITS

- Supports a mix of coax and fiber users with a standards-based, single indoor or outdoor device that interconnects through various high-performance network interfaces
- Reduces transport and hub infrastructure power and real-estate requirements, allowing multiple types of service providers to benefit from lower CAPEX and OPEX
- Leverages Harmonic's extensive DOCSIS, HFC and RF technology expertise to optimize the delivery of triple-play services to multiple dwelling units, office buildings, educational facilities and hospitality locations

NSG Exo is available in indoor (top) and outdoor models.

One of the industry's first offerings to support a Distributed Access Architecture (DAA), the CCAP-ready NSG Exo delivers DOCSIS/EuroDOCSIS/J-DOCSIS CMTS services today, with universal edgeQAM capabilities coming soon. The ability to leverage standard DOCSIS back-office provisioning and DOCSIS cable modems, while supporting a mix of FTTx and coax customers over the same network, allows cable and telco service providers — and premise owners — to utilize a single device to deliver triple-play services to existing coax infrastructure, such as multiple dwelling units (MDUs), office buildings, college campuses and hospitality locations. The result is an increased opportunity to generate new revenue streams, or expand on existing ones.

As part of a low-cost and highly scalable "Flexible Edge" architecture, in which a simplified and unified access network allows operators to deliver differentiated residential, commercial and wireless services across any access medium, NSG Exo supports the ability to keep pace with evolving business and industry requirements.



Enables cost-effective, high-performance delivery of triple-play services to organizations operating over coax infrastructure.

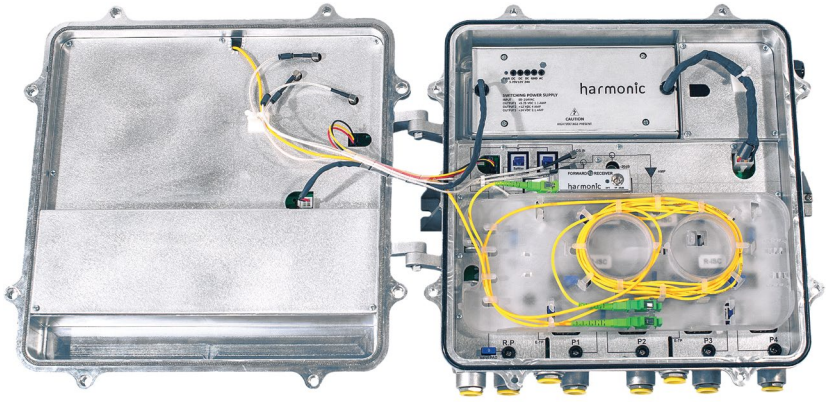
NSG Exo is the latest product from Harmonic to leverage its industry-leading CableOS, the cable edge platform of choice for tier-1 MSOs. A single NSG Exo can deliver up to 16 downstream channels and four upstream channels to hundreds of subscribers. CAPEX savings are realized through the ability to deploy high-quality, high-speed video, voice and data services from a single device, and from removing analog transport requirements from the network. OPEX is lowered as a result of removing RF and its associated space and power requirements from the headend or hub. Deep fiber deployment also means a signal has less distance to travel over coax before reaching the subscriber, helping to preserve signal quality and performance.

Available in either an indoor or outdoor enclosure, the low-power and quiet NSG Exo fits perfectly in tight locations, whether the basement of an MDU or a cable pedestal. The outdoor enclosure is 15 x 16.2 x 5.9 inches (38.2 x 41.1 x 15.1 cm) and weighs just 22 pounds (10 kg), and can be used to cost-effectively combine broadcast video services in the same enclosure. Form factor of the indoor unit is 1 RU, with front-panel connections making the unit easy to set up and maintain.

NSG Exo provides advanced security services, so operators can be assured that their network is protected and users are authenticated. High MTBF (mean time between failure), as well as effective platform management via in-band or directly connected configuration and monitoring, provide the highest levels of reliability.

Ensuring Success with Service Expertise

With thousands of successful installations, Harmonic has unique, extensive knowledge of the cable edge environment and unsurpassed expertise in managing live production networks. 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 edge network, from back-office video control planes to IP backbones to deep-fiber HFC nodes.



The outdoor version of NSG Exo features superior RF performance, and can be pedestal, wall or strand mounted.

DOCSIS FEATURES

Single MAC domain
DS & US channel bonding with partial service
CM support: DOCSIS 2.0 & 3.0
Maximum service flows: 1,024
DOCSIS classification
Load balancing (CM count and bandwidth utilization-based)
Forward error correction
Concatenation
Fragmentation
Multicast replication, multicast DSID forwarding (MDF) support
Baseline privacy interface plus (BPI+) - DES encryption
Upstream ToS (Type of Service) overwrite
Upstream scheduling: Best effort, UGS, UGS-AD, rtPS, nrtPS

GENERAL

System Software	Linux-based OS

DOWNSTREAM CHANNELS

Number of Channels	16
Throughput	960 Mbps
Frequency Range	54-1006 MHz
Amplitude Frequency Response	< 0.25 dB (within any QAM carrier) < 2 dB (between any two QAM channels on same RF port)
QAM Modulations	ITU-T J.83 - Annex A (8 MHz), B (6 MHz), C (6 MHz)
QAM Constellations	Annex A/B/C: QAM 64, 256, 1024
QAM Agility	Window size of 192 MHz
MER	
Unequalized	> 39 dB (Typical: > 42 dB)
Equalized	> 45 dB (Typical: > 48 dB)
BER (pre FEC)	< 1 x 10-10

UPSTREAM CHANNELS

Number of QAM channels	4
Throughput	160 Mbps (≤ 40.96 Mbps per channel)
Channel Width	1.6 MHz, 3.2 MHz, 6.4 MHz
Frequency Range	5-65 MHz
Frequency Response	+/- 1 dB
Modulation Type	QPSK, 16-QAM, 32-QAM, 64-QAM, 128-QAM, 256-QAM (128 QAM, 256-QAM for S-CDMA for extended Broadcom-based cable modems)
Modulation Method	A-TDMA, S-CDMA
Monitoring	MER, BER, CNR
Input Power Level	-13 to 23 dBmV per channel

NETWORK MANAGEMENT OPTIONS

Management Options	DOCSIS: CLI, SNMP
SNMP Support	DOCSIS & IETF MIBs
Logging and Monitoring	Alarms status monitoring Syslog
Secure Access	SSHv2, TACACS+ AAA
RF Monitoring	Separate US and DS RF monitoring ports

INDOOR UNIT SPECIFICATIONS

INTERFACES

NSI Port	One RJ45 port or one port supporting pluggable optical or copper pt-to-pt or pt-to-mpt GigE, GPON or EPON networks
Total Throughput	1 Gbps Full duplex
RF Ports	Two, each port assignable as a DS, US or combined DS/US channel (the identical RF spectrum is served from both ports)
RF Monitoring Ports	Two (one DS, one US)
RF Port Connectors	F-type, 75 Ω, color coded for US and DS
Downstream	
Max RF Output Power	44 dBmV per 8 MHz channel, with 16 active channels
RF Power Adjustment Range	8 dB
Output Return Loss	> 14 dB, within any channel from 5-1002 MHz
Linear Equalizer Slope	10 dB

POWER

Power Supplies	One
Input Voltage Range	85-264 VAC
Line Frequency	47-63 Hz
Power Consumption	< 45 W

PHYSICAL

Dimensions (W x H x D)	17.1 in x 1.7 in x 12.75 in (1 RU) 43.4 cm x 4.3 cm x 32.4 cm
Weight	5.0 lbs/2.3 kg

ENVIRONMENTAL

Operating Temperature (Non-Condensing)	+32° to +122° F 0° to +50° C
Storage Temperature (Non-Condensing)	-40° to 167° F -40° to 75° C
Relative Humidity (Non-Condensing)	0-95%
Operating Altitude	≤ 15,000 feet (4,572 meters)

OUTDOOR UNIT SPECIFICATIONS

INTERFACES

RF Ports	
Number of Ports	Two or four
Output Level	
Four RF Ports	52 dBmV per analog channel
Two RF Ports	55 dBmV per analog channel
C/CSO	65 dB[1]
C/CTB	67 dB[1]
Port Impedance	75 Ω
Return Loss	> 16 dB over operating band
Output Variation over Temperature	±1.5 dB
Digital Optical Port (CCAP)	
SFP Module	Optical pt-to-pt or pt-to-mpt GigE, GPON or EPON networks
Analog Optical Port (Broadcast)	
Frequency Range	54-1006 MHz
Optical Interface	SC/APC
Input Level	-6 to +1 dBm
Optical Input Return Loss	> 45 dB
Responsivity	0.85A/W for 1310 nm 0.95 A/W for 1550 nm
RF Test Points	
External	2 – Forward/downstream
Internal	3 – Forward/downstream, 2 – upstream
Directional Coupling	-20 ± 1 dB

POWER

Power Supplies	One
Input Voltage Range	90-264 VAC or 40-95 VAC
Line Frequency	47-63 Hz
Consumption	
Narrowcast w/o broadcast input	< 40 W
Narrowcast w/ broadcast input	< 90 W

PHYSICAL

Mounting	Pedestal, stand, wall
Enclosure	IP56 per IEC 60529 (edition 2.1) clause 4.1
Dimensions (W x H x D)	15.0 in x 16.2 in x 5.9 in 38.2 cm x 41.1 cm x 15.1 cm
Weight	22 lbs/10 kg

ENVIRONMENTAL

Operating Temperature (Non-Condensing)	-13º to 131º F -25º to +55º C
Storage Temperature (Non-Condensing)	-40º to 167º F -40º to +75 º C
Relative Humidity (Non-Condensing)	0-95%
Operating Altitude	≤ 13,123 feet (4,000 meters) (Telcordia GR-63-CORE)

Note 1. Nominal output level 55 dBmV and slope 14 dB @ 55-1003 MHz; 78 NTSC analog CW carriers 50-550 MHz and 75 QAM channels 6 dB below analog optical input level 0dBm OMI=3.5%.

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