

# MCX8000 Multi-Carrier Satellite Gateway



The MCX8000 multi-carrier satellite gateway is a high density, high availability, fully redundant slotted-based modular system designed for Direct-To-Home (DTH) broadcasting, primary distribution to head ends and OTT delivery of video and audio content. Thanks to its slotted based architecture, the MCX8000 system provides a 3 in 1 solution designed to reduce down-time and simplify operational support costs with two hot-swappable modem modules that can be added or removed without any special tools or affecting the operation of the other slot, hot-swappable power supply units and an integrated 1+1 redundancy switch.

Built upon the M(DM)6100 and MCX70000 software suites capabilities, the MCX8000 can provide up to four 133 Msps carriers to be modulated with full support of the DVB satellite standards up to DVB-S2X. Transport streams embedded in on eof the received carriers can be output (or transmodulated) on one of the eight (optional) ASI or four Ethernet ports. The same data interfaces can be used as input ports for the modulator. The MCX8000 also features a web-base GUI dashboard designed to guide you through the configuration of the system and align with any use case.

## Media & Broadcast

**Direct-To-Home (DTH)**  
**Distribution to Towers (DTT)**  
**Distribution to Head-Ends**  
**OTT delivery**

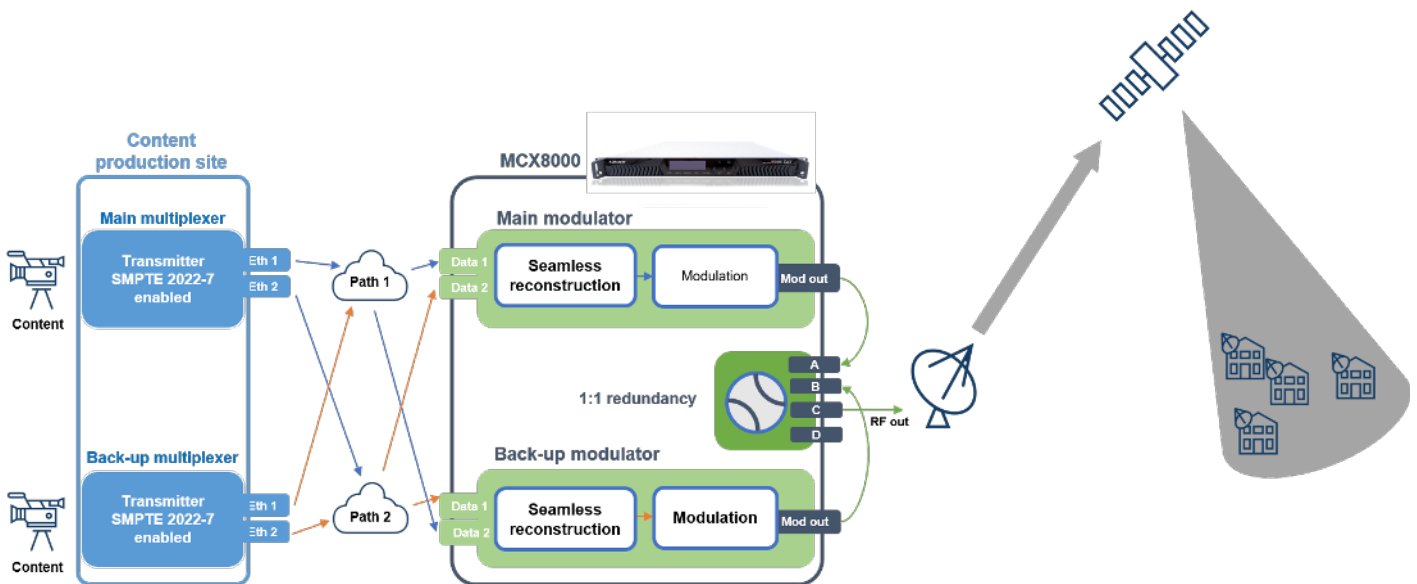
### Main Advantages:

- Upgrade or downgrade to any of the configurations by adding or removing modules and loading the appropriate software licenses
- Highest system reliability and service uptime through robust design and industry leading redundancy solutions
- Low TCO using very high bandwidth efficiency technology options, and ease of monitoring and control
- Clean Channel Technology provides up to 15% bandwidth efficiency gains on top of the DVB-S2 standard
- Future-proof design combining video and IP multiservice capabilities, supports transport of today's and tomorrow's services
- Multi-stream reception and transmission (16 streams in modulator)

# Use Cases

## Direct-to-Home

Direct-to-Home or DTH enables a broadcasting company to directly deliver the satellite signal to consumer households. The consumer has an individual reception system existing of an antenna/dish and satellite Integrated Receiver-Decoder (IRD)/receiver). Bringing quality content to the largest possible subscriber base is one of the key factors of DTH. However, the bandwidth pipe over satellite is limited and could impose a hard limit on quality, subscriber coverage and growth.



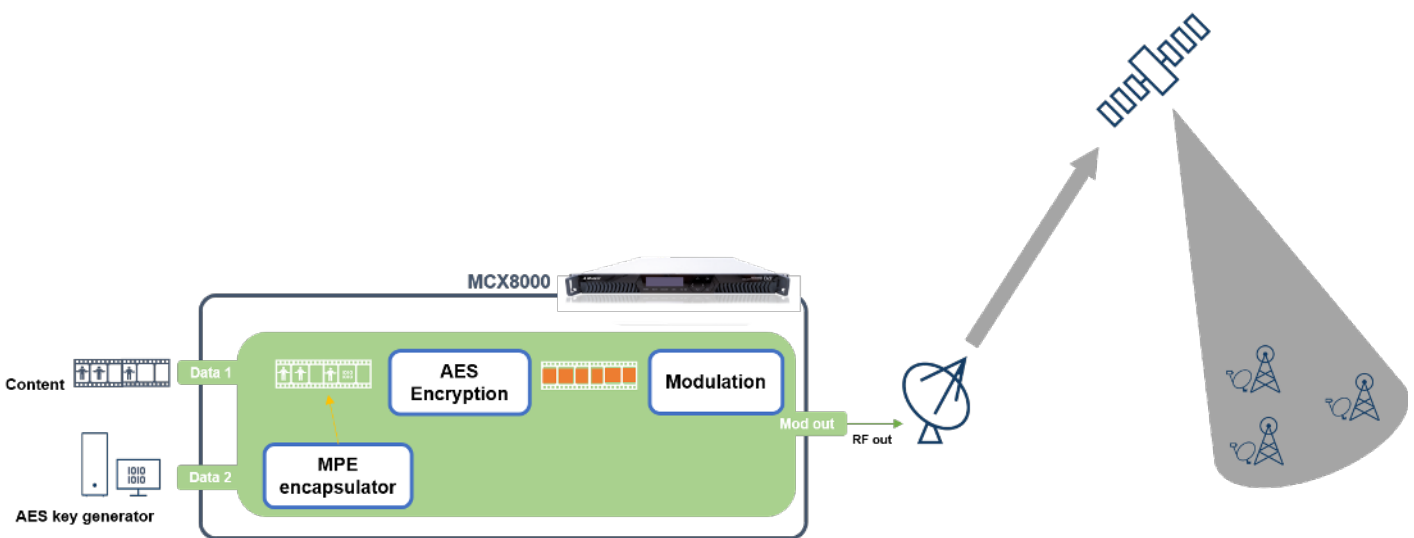
The MCX8000 Multi-Carrier Satellite Gateway has the right features for squeezing the maximum throughput out of the available bandwidth, whether using the DVB-S, DVB-S2, or DVB-S2X standard. It supports SMPTE 2022-7 Seamless Protection Switching providing reliable transport stream delivery.

Thanks to its slotted based architecture, the MCX8000 system provides a 3 in 1 solution designed to reduced down-time and simplify operational support costs with two hot-swappable modem modules that can be added or removed without any special tools or affecting the operation of the other slot, hot-swappable power supply units and an integrated 1+1 redundancy switch.

## Distribution-To-Towers

Distribution to Towers or DTT utilizes conventional antennas (or aerials) instead of satellite dishes or cable connections to deliver video and audio services to customers. While the transmission of radio frequencies through airwaves is like analogue television, the biggest difference is that the multiplex transmitters enable the reception of multiple channels on a single frequency range.

The MCX8000 Multi-Carrier Satellite Gateway ideally fits as a satellite front-end feeding multiple IRDs (Integrated Receiver Decoders). The MCX8000 receives multiple MPEG-2 transport streams from a single or multiple saturated transponder(s) using DVB-S2X. It then extracts those transport streams and feeds them over ASI or IP into the existing installed base of IRDs. One MCX8000 can be used for tens of TV channels. In case older IRDs have no ASI nor IP input, the MCX8000 can even transmodulate the DVB-S2X multistream carrier into a traditional DVB-S/DVB-S2 single stream carrier.

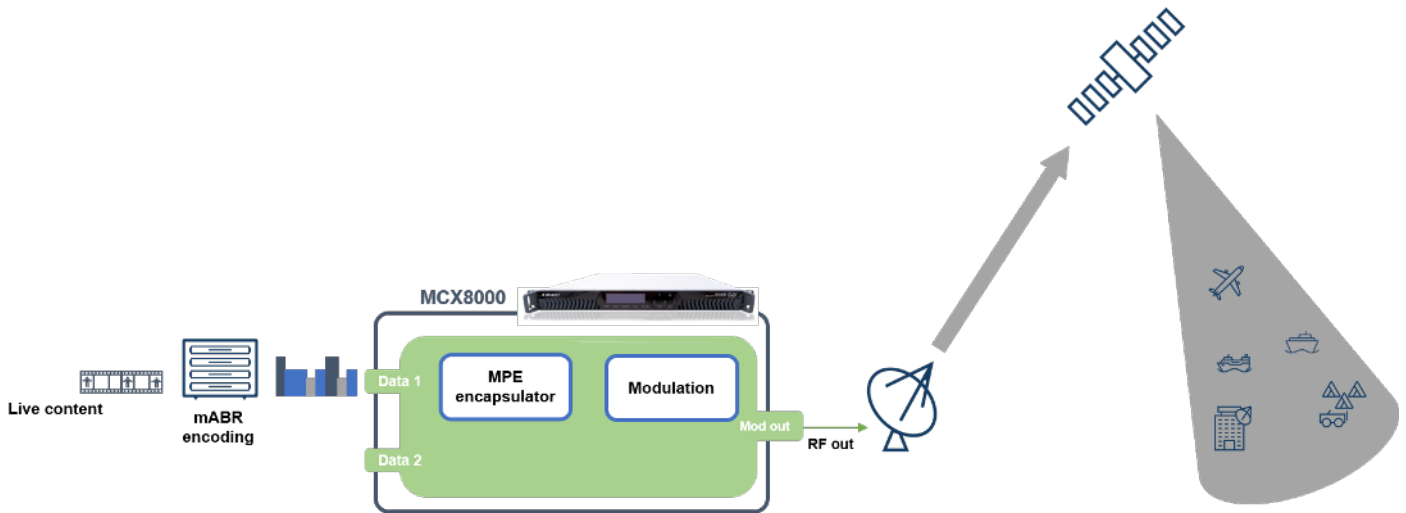


### What are the benefits to use the MCX8000 for DTT?

AES or Asynchronous Encryption Standard allows to encrypt the content delivered to the towers. In the ST Engineering iDirect's modulators and demodulators, two different AES keys can be defined (odd and even key). New keys are pushed to the demodulator via in-band uni-directional remote control. Change keys on the fly? The IP data from the AES key generator is MPE encapsulated with the built in MPE encapsulator. The MPE encapsulated data is injected in the transport stream by replacing some null packets present in the transport stream.

## Over-The-Top Distribution

Over-the-top or OTT refers to the productized practice of streaming content to customers directly over the web. It represents the future of entertainment. It is essential that service providers offer content that is ready to be viewed on consumer devices. However, at the same time, it is imperative to keep costs under control.



Growing traffic is a fundamental challenge when broadcasting popular content – especially live – to a wide audience. Bandwidth needs to be used efficiently and traffic needs to be minimized.

A Content Distribution Network (CDN) significantly reduces traffic on the distribution backbone by storing multiple copies of the same content as close as possible to the consumer. At the same time, start latency is minimized as well as buffering of the content. Converting as much unicast transmission as possible to multicast transmission avoids sending multiple copies of the same content across the network, thus saving a huge amount of bandwidth. The received content will typically be converted to unicast for delivery over Wi-Fi towards mobile devices.

Whether the receiving device is a professional receiver, for reception at cellular towers (3G/4G/5G) or ATSC 3.0 towers, or Customer Premises Equipment (CPE) used in the home or at a business, they can both be equipped to receive multicast traffic and host a CDN. Broadcast transmission is integral to successful content distribution. And at the heart of that is a traditionally overlooked solution: satellite.

# Specifications

## Key Features

- Configurations:
  - 2x DVB-S2X carrier modulators with optional ASI interfaces-
  - 4x DVB-S2X carrier modulators with optional ASI interfaces (2 modulators per modem module)
  - 2x DVB-S2X carrier modulators with integrated 1+1 redundancy switch
- Minimum symbol rate: 256 kbaud
- Maximum symbol rate: 133 Mbaud
- Data rates up to 425 Mbsps
- IF (50/180) and L-Band (950 - 2150) high power outputs
- Optional Equalink 3 pre-distortion provides up to 15% bandwidth gain in DVB-S2(X) 8PSK mode, higher Quality of Service (QoS) and geographic coverage
- Highest system reliability and service uptime through robust design and industry leading redundancy solutions:
  - Integrated 1+1 redundancy switch
  - Exceptional jitter recovery on TS over IP inputs with SMPTE 2022 FEC
  - Redundant optional ASI or GbE interfaces in single stream mode
  - Redundancy with main TS over ASI and back-up TS over IP input
  - Redundant optional ASI interfaces for up to 8 TS input streams (4 per modem board)
  - Stream and Source redundancy on TS over IP inputs
  - Optional Seamless Protection Switching acc. SMPTE 2022-7 on TS over IP inputs
  - User configurable alarm table for device & carrier redundancy switching
  - Carrier-based redundancy switching in a multiple modulator 1+1 configuration
  - Input redundancy with Payload Stuffing as Switching Criterion
  - Input redundancy with TR 101 290 Priority 1 parameters as Switching Criterion
  - Built-in TS Analyzer with PCR jitter measurements
  - Accurate link margin monitoring using Noise & Distortion Estimator (NoDE) tool
  - RFI reduction using DVB RF Carrier ID (DVB-CID) and NIT table CID
  - Automatic TS rate adaptation
  - ASI and TS over IP monitoring outputs of input TS streams
  - L-band monitoring output
- Market leading RF purity and performance
- Programmable amplitude slope equalizer
- 8 x PRBS generators and 3 x PRBS detectors for link performance tests (per modem board)
- Optional high stability internal clock reference
- Optional dual AC power supply
- Low TCO using very high bandwidth efficiency technology options, and ease of monitoring and control:
  - DVB-S2X, DVB-S2, DVB-DSNG and DVB-S compliant
  - QPSK, 8PSK, 16APSK, 32APSK, 64APSK, 128APSK and 256 APSK
  - Clean Channel Technology provides up to 15% bandwidth efficiency gains on top of the DVB-S2 standard
  - Optional 2% roll-off on modulator side for highest efficiency
  - Multi-stream CCM or VCM mode with ISSY
  - Selection of DSNG profiles acc. WBU-ISOG including DVB-S2X standard
  - Secure front panel, SNMP, HTTP and CLI interface
- Future-proof design combining video and IP multiservice capabilities, supports transport of today's and tomorrow's services:
  - Multi-stream reception and transmission (16 streams in modulator)
  - Up to 8 Transport Streams mux/demux on GbE (TS over IP) and 4 on optional ASI interfaces (per board)
  - Transport Stream over IP outputs optimized for minimal Packet Inter-Arrival-Time
  - VLAN support
- 4 x built-in encapsulators for opportunistic data insertion of at least 100 Mbps (per modem board), interoperable with IRDs that support Multi-Protocol Encapsulation (MPE)
- Supports SFN Networks using transparent TS pass-through
- Optional AES encryption/decryption per ISI stream and per carrier
- Optional BISS scrambler and descrambler
- External reference input
- Optional 10 MHz reference output
- Easy integration with industry leading management systems (EMS/NMS/OSS)
- Feature-based pricing and software upgrades
- Pay-as-you-grow flexible licensing scheme
- Remote in-band management
- Remote over-the-air software upgrade



## Data Interfaces

### ASI Interface (Optional)

Single stream mode

4 selectable ASI inputs on BNC (F) – 75 Ohm (coax)

188 or 204 byte mode

Rate adapter

MPTS or SPTS according to ISO/IEC 13818

Multistream mode

4 BNC(F) - 75 Ohm (coax) connectors individually configurable as input or output or as 3 redundant TS inputs with auto switching

188 or 204 byte mode

Rate adapter

MPTS or SPTS according to ISO/IEC 13818

### ETH Interface

Auto switching 10/100/1000 Base-T Ethernet interface

VLAN support

Transport stream over IP interface (UDP/RTP), unicast or multicast

Seamless Protection Switching SMPTE 2022-7 on TSolP inputs (optional) in the 300 kbps - 90 Mbps bit rate range

Forward Error Correction SMPTE 2022-1 and -2

Rate adapter

MPTS or SPTS according to ISO/IEC 13818

## Content Encryption and Protection

### BISS SCRAMBLER (OPTIONAL)

Support for BISS-0, BISS-1 and BISS-E

On 4 TS (SPTS or MPTS) in modulator configurations

Up to 200 Mbps per TS

Up to 2 scramblers per modem board

### AES ENCRYPTION (OPTIONAL)

AES encryption of Baseband frames

64-bit, 128-bit or 256 mode

One AES encryption per carrier

Single key or one key per ISI stream

Up to 1 x 140 Mbps or 4 x 32 Mbps or 6 x 23 Mbps/ carrier

## IP/Ethernet frames Encapsulation/Decapsulation

4 MPE encapsulators per board

4 MPE decapsulators per board

Layer 3 static router over satellite

Layer 2 bridge over satellite (VLAN compatible)

Max aggregate: 160 Mbps

## Modulation

### SUPPORTED MODULATION SCHEMES AND FEC

#### DVB-S

- Outer/Inner FEC: Reed Solomon / Viterbi
- MODCODs: QPSK: 1/2, 2/3, 3/4, 5/6, 7/8

#### DVB-DSNG

- Outer/Inner FEC: Reed Solomon / Viterbi
- MODCODs: 8PSK: 2/3, 5/6, 8/9 - 16QAM 3/4, 7/8

#### DVB-S2 (acc. ETSI EN 302 307 v1.2.1 for DVB-S2)

- Outer/Inner FEC: BCH/LDPC
- 52 MODCODs (short & normal frames)
  - QPSK: from 1/4 to 9/10
  - 8PSK: from 3/5 to 9/10
  - 16APSK: from 2/3 to 9/10
  - 32APSK: from 3/4 to 9/10

#### DVB-S2X standard

- Outer/Inner FEC: BCH/LDPC
- 53 MODCODs (normal frames):
  - QPSK: from 1/4 to 9/10
  - 8PSK: from 3/5 to 9/10
  - 16APSK: from 26/45 to 9/10
  - 32APSK: from 32/45 to 9/10
  - 64APSK: from 11/15 to 5/6
  - 128APSK: 3/4; 7/9
  - 256APSK: 32/45; 3/4
- 13 Linear MODCODs (normal frames):
  - 8APSK-L: 5/9; 26/45
  - 16APSK-L: from 1/2 to 2/3
  - 32APSK-L: 2/3
  - 64APSK-L: 32/45
  - 256APSK-L: 29/45 to 11/15
- 41 MODCODs (short frames):
  - QPSK: from 11/45 to 8/9
  - 8PSK: from 7/15 to 8/9
  - 16APSK: from 7/15 to 8/9
  - 32APSK: from 2/3 to 8/9

Support of DVB-S2 VCM mode

### SYMBOL RATE RANGE

#### Modulator

DVB-S2, DVB-S2X 256 kbaud - 133 Mbaud

DVB-S & DSNG 1 - 45 Mbaud

### FRAME LENGTH

DVB-S & DVB-DSNG 188 bytes

DVB-S2 & DVB-S2X  
Short Frames 16200 bits

DVB-S2, DVB-S2X  
Normal Frames 64800 bits

### CLEAN CHANNEL TECHNOLOGY

Roll-off option (on modulator): 2%

Roll-off: 5% -10% -15% -20% - 25% - 35%

Optimum carrier spacing

Advanced filter technology

### CARRIER INTERFERENCE REDUCTION

DVB RF Carrier ID (DVB-CID)

- Spread Spectrum Modulator (BPSK)
- Supports User Data
- Compliant to ETSI 103 129 v1.1.1 (2013-05)

### EQUALINK 3

- Linear and non-linear predistortion for all MODCODs

## Modulation Interfaces

### L-BAND (CONFIGURATION OPTION) (QTY: 0-4)

Connector SMA(F), 50 Ohm

Frequency 950 - 2150 MHz (10 Hz steps)

Level -35/+7 dBm (+/- 2dB)

Return loss > 14 dB

Switchable 10 MHz Reference

Spurious performance: better than - 65 dBc/4 kHz @ +5 dBm output level and > 256 kbaud

### IF-BAND (CONFIGURATION OPTION) (QTY: 0-4)

Connector BNC (F) - 75 Ohm (intermateable with 50 Ohm)

Frequency 50 - 180 MHz (10 Hz steps)

Level -35/+10 dBm ( $\pm$  2 dB)

Return loss 50 Ohm: > 14 dB / 75 Ohm: > 20 dB

Spurious performance: better than - 65 dBc/4 kHz @ +5 dBm output level and > 256 kbaud

Non-signal related: < - 80 dBc @ +5 dBm output

### L-BAND MONITORING (QTY: 0-4)

Connector SMA (F), 50 Ohm

Frequency same as L-Band output

Frequency or 1050 MHz in case of IF output option only

Level -45 dBm

Return loss > 10 dB

### 10 MHz REFERENCE INPUT

Connector BNC (F), 50 Ohm

Output level +3 dBm (+/- 2 dB)

## Internal 10 MHz Reference Frequency

### STANDARD STABILITY

Stability: +/- 2000 ppb over 0 to 70°

Ageing: +/- 1000 ppb/year

### VERY HIGH STABILITY (OPTIONAL)

Stability: +/- 2 ppb over 0 to 65°C

Ageing: +/- 500 ppb/10 year

## Monitoring Interfaces

### MONITOR AND CONTROL INTERFACES

Web server GUI (HTTP) via web browser

M&C connectivity via separate Ethernet links

Diagnostics report, alarm log (HTTP)

SNMP v2c

RESTful API

### ALARM INTERFACE

Logical interface and general device alarm

## Physical

Height: 1RU, width: 19", depth 51 cm,

Weight: 9.3 kg

Box:

- Size: 720x600x190 mm
- Weight (max): ~11.5 kg

Power supply:

- 90-130 & 180-260 Vac
- 260 VA, 47-63Hz

Temperature:

- Operational: 0°C to +50°C
- Storage: -40° to +70° C / -40°F to +158°F

Humidity: 5% to 85% non-condensing

CE label and UL

PSU Module

- Module size: 41x165x199mm
- Module weight: 1020 gr

Front panel module

- Module size: 43x63x421mm
- Module weight: 340gr

Modem module

- Module size: 43x150x315 mm
- Module weight: 340gr

Platform module

- Module size: 43x60x315 mm
- Module weight: 360gr max

