SATELLITE NEWSGATHERING AND FIXED BROADCAST CONTRIBUTION & EXCHANGE

Fixed and Mobile Broadcast Contribution Challenges

Today, broadcasters are faced with many challenges in operating their business. From mobile Fast News Gathering (FNG) to fixed, high quality HD content exchanges, broadcast transmission formats and delivery methods evolve continuously. The adoption of new standards, aimed at a better user experience, drive broadcasters to prepare their infrastructure for the next evolution: Higher quality video channels (e.g. the introduction of new codec standards including HEVC and high resolution formats such as 4K Ultra HD), a continuous increase of the amount of available content, and of course the lean-forward consumption of content on different devices with varying resolutions.

Broadcasters are urged to get premium content and advertisements on- air faster than ever before. The increasing consumption of content on any device, at any time, at any place, forces broadcasters to exchange content in various, sometimes multiple, formats across different transmission channels (OTT, IPTV, high quality HD, low quality mobile) around the world and in many different time zones.

To be able to exchange content in multiple formats across different transmission channels, broadcasters benefit from solutions that support flexible workflows and are scalable with their customer base and broadcast services on offer.

BROADCAST MODEMS
DIALOG
powered by
Newtec iDirect

Just like other businesses, broadcasters are also faced with increasing pressure on operating margins, while also having to retain the high expectations in service availability and reliability (Service Level Agreement compliance). To evolve with the changing technologies, broadcasters must **have solutions that are flexible and scalable**, and at the same time guarantee bandwidth efficient, OPEX friendly transmissions.

All of these evolutions push broadcasters to upgrade their infrastructure for more flexible, scalable and efficient operations. These operations need to support very flexible workflows, supporting multiple video, audio and metadata formats and profiles, as well as both ad-hoc breaking news tranmissions, and scheduled sports/events exchanges, etc.

The emergence of single all-IP connectivity for both broadcast and data services can address these complex operations, opening the possibility to use a single multiservice infrastructure for live content, file exchanges, remote monitoring and control, broadband access, access to content archives and media asset management systems, to name a few.

ST Engineering iDirect has solutions enabling traditional broadcasting workflows, as well as solutions to handle the more complex and customized workflows.

For traditional broadcasting workflows, the MDM6100 Broadcast Satellite Modem has a plethora of features to satisfy the most demanding broadcaster when it comes to bandwidth efficiency, low delay point- to-point or point-to-multipoint video contributions

When broadcasters are faced with more **demanding, complex workflows**, the Newtec Dialog® system can provide a solution that is truly flexible in adapting the platform to the broadcaster's own linear and non-linear broadcast workflows, supporting multiple broadcast live and file exchange sessions, telephony and data services.

At the same time, Newtec Dialog's built-in scalability features allow the system to be sized exactly to the customer's needs, ensuring optimal CAPEX. Finally, our renowned technologies for optimizing satellite transmission efficiency, ensures that the Newtec Dialog system can deliver a fully- fledged broadcast solution with a minimal OPEX cost.

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Manually Operated Broadcast Workflows

Traditional broadcast contribution workflows typically used by FNG or Satellite News Gathering (SNG) operators are, to a large extent, still manually operated. Manual FNG / SNG operation requires an operator of the flyaway terminal or the SNG van to coordinate with a central Network Operations Center (NOC) to determine the right frequency settings for correctly establishing the satellite link with the central news room. Skilled SNG operators are required to correctly configure the modem, perform a time consuming line-up procedure, etc.

The need for supporting both linear and non-linear, tapeless workflows has triggered a dramatic increase in the capabilities and subsequent complexity of a modern SNG broadcast network. Operating these SNG's has become increasingly challenging, and therefore, user friendly, flexible SNG transmission equipment is key for successfully bringing breaking news to the studio.

ST Engineering iDirect's satellite broadcast modems deliver the complex features today's broadcasters need, while also ensuring user friendly and hassle-free operations.

In this respect, the broadcast modems support Digital Satellite News Gathering (DSNG) profiles according to the WBU- ISOG working group. This set of pre-configurations will ease line- up, shorten time-to-deployment and limit transmission errors.

WBU-ISOG profiles detailed profile parameters

Each profile/level combination defines unambiguously

- Modulation standard, e.g. DVB-S2
- Order of modulation, e.g. 16APSK
- FEC, e.g. 5/6
- Occupied bandwidth, e.g. 9 MHz for the News-9 profile
- Pilots ON/OFF selection
- Frame length, normal or short
- Roll-off factor, e.g. 10%
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Derived parameters are

- Symbol rate, transport rate, Receiver threshold, C/N

Video & Audio coding

- Encoding parameters (decoder slaves automatically on encoder)

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Today's DSNG Contributions

A common broadcast contribution workflow for live streaming of video content from the SNG or Outside Broadcast (OB) van to the broadcast studio is based on industry standards like ASI video interfaces and DVB-S/DVB-S2 modulation. The M6100 and MDM6100 Satellite Broadcast Modems inherently support this video interface and modulation scheme, **ensuring interoperability with any brand and model of video encoding platform, as well as all existing DVB set- top boxes.**

Even if interoperable transmissions are a must, broadcasters still have the option of increasing the efficiency of the transmission by enabling Clean Channel Technology®, which results in bandwidth gain of up to 15%, by means of reduced carier roll-offs of up to 5%.

A typical concern for DSNG operations is the interference they might cause with other carriers when the DSNG is pointed badly or the modulator is poorly configured. In order to limit the consequences of an erroneous transmission, the M6100 and MDM6100 can be configured to inject a Carrier Identifier (CID) into the SCPC carrier in accordance with the DVB-CID standard option, or according to the DVB NIT table CID insertion as defined by the WBU-ISOG working group. Satellite operators can use the CID to pinpoint any interference in the shortest delay and contact the DSNG operator for corrective action.

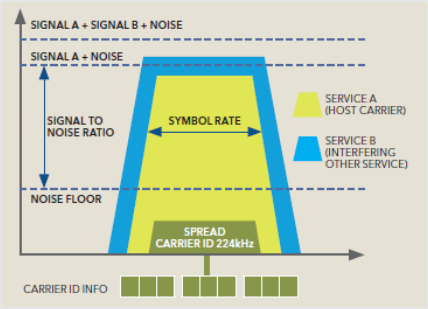
How you can use Carrier ID to combat Carrier Interference?

Option 1: Carrier ID in the DVB NIT Table (WBU-ISOG – 2009)

- Injects device identification into the MPEG TS by updating the NIT Table.
- Is only possible for MPEG Transport streams (i.e. video transmissions).
- CID is not recoverable if the main carrier is jammed or down.

Option 2: DVB Carrier ID Standard (DVB-CID – 2013)

- Device identification is injected into a low power carrier and transmitted below the noise floor of the main carrier. The ID is read from the Carrier by Special Measurement Receivers.
- DVB-CID is agnostic to the traffic carrier or the transport mechanism (supports both MPEG TS video as IP data).
- The DVB-CID mechanism is more robust, as it can be decoded even if the main carrier is jammed.



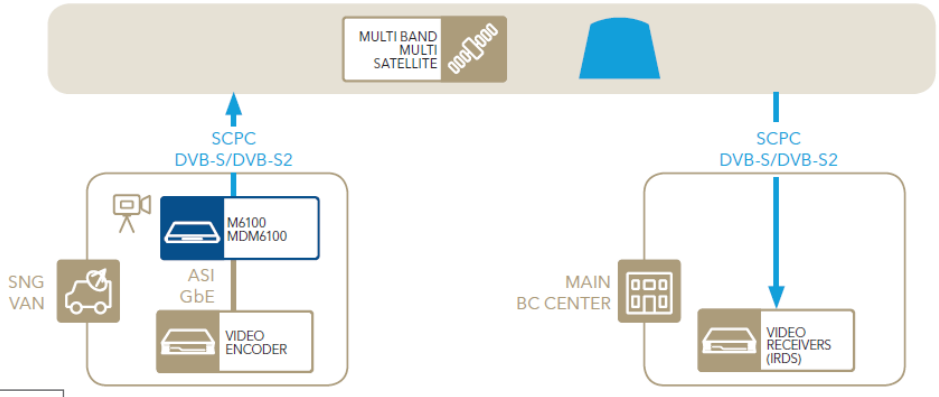


Figure 1: Interoperable SNG operations

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High Efficiency DSNG Contributions

In cases where the content exchange does not need to be received by legacy broadcast receivers, the broadcaster can enable a lot of new transmission technologies to boost the transmission efficiency considerably. This way, the broadcaster can considerably increase the quality of its video contributions, with an equal OPEX cost, or increase the number of simultaneous contribution channels.

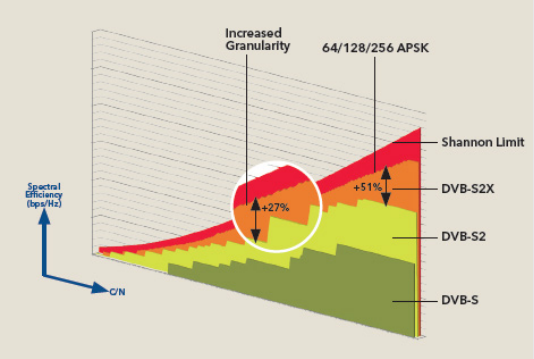
Technologies like DVB-S2, Clean Channel Technology and the DVB-S2X standard allow for considerable bandwidth gains.
The DVB-S2X standard, fully endorsed by ST Engineering iDirect, enables very cost- effecitve HD and 4K transmissions through optimal MODCOD schemes up to 64APSK without compromising on availability and reliability.

The DVB-S2 Multistream feature allows users to aggregate multiple video transport streams into one satellite carrier, for example, supporting multi-camera contributions to a central studio. This avoids the need for expensive OB Vans for video production, allowing instead remote video production at the receiving studio only.

The MDM6100 Satellite Broadcast Modem supports up to 6 ASI inputs to multiplex up to 6 ASI streams into one multistream carrier, allowing up to 6 video streams to be transmitted over a single carrier. On top of this, up to 8 IP streams can additionally be transmitted on the same carrier.

10 improvements in DVB-S2X

- Smaller roll-offs
- Advanced filtering of satellite carriers
- Increased granularity in MODCODs
- Higher order modulation: 64/128/256 APSK support
- Linear and non-linear MODCODs
- Better implementation of MODCODs
- Wideband support
- Very low SNR support for mobile applications
- Channel bonding
- Additional standard scrambling sequences to mitigate co-channel-interference (CCI)



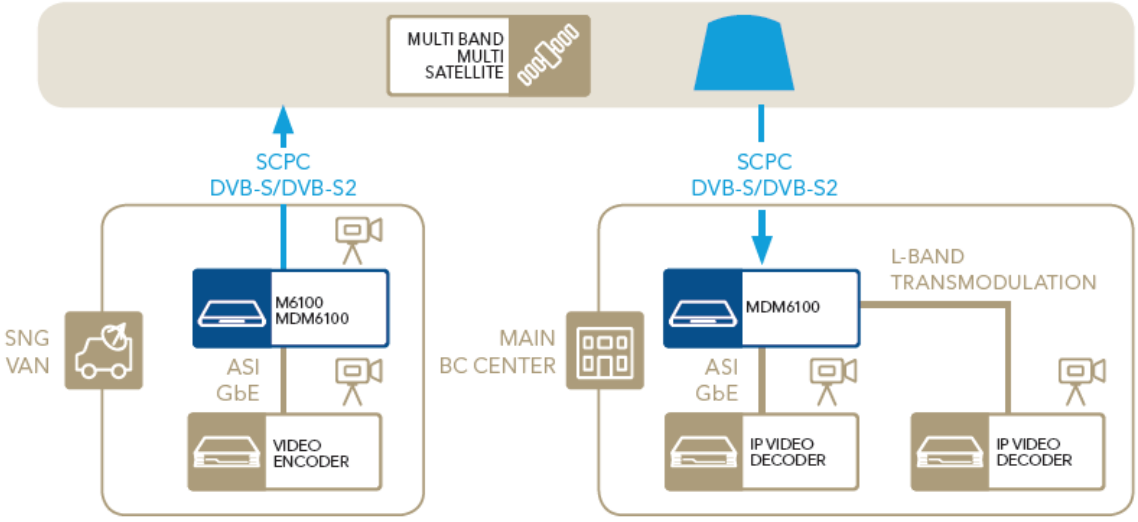


Figure 2: High efficient SNG operations

Interactive, Live DSNG Contributions

The introduction of IP-based transmissions in the broadcast market opens up possibilities for new workflows, not necessarily tied to unidirectional video transport streams. The combination of IP and legacy broadcast transmissions adds the option of setting up a carrier for both IP based and traditional, ASI based contribution simultaneously.

This allows, for example, broadband connectivity and voice communication concurrently with the video transmission multiplexed on the same SCPC carrier. It also allows a central operator to monitor the DSNG during the video session remotely. These additional services enable coordination with the central news room operator before or during the transmission, interaction with his news room management system, etc.

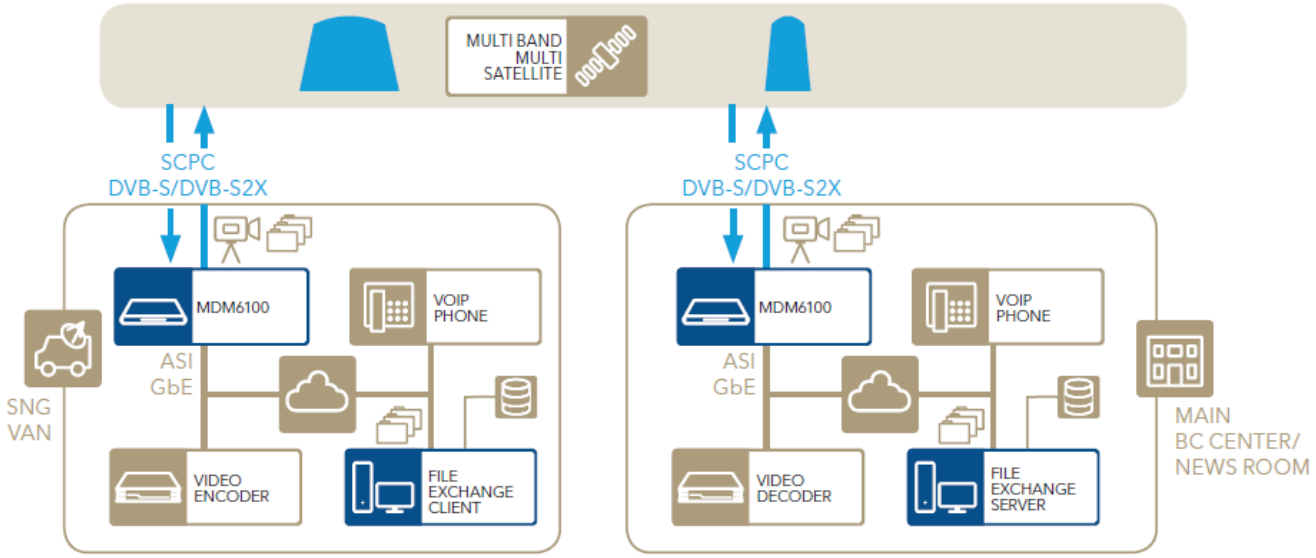


Figure 3: Interactive, live DSNG operations

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Interactive, Live and File DSNG Contributions

Support for bidirectional IP transfers also enables file contribution capabilities from the DSNG to the central broadcast center, thereby supporting the ingestion of edited content into the news room Media Asset Management (MAM) system.

In combination with our File Exchange Manager, a broadcast operator has the possibility to transfer error-free file based content from his premises to the central studio.

The File Exchange Manager is a software product that can support various use cases typically used within satellite broadcast, serving a broad range of point-to-point and point-to-multipoint applications.

Newtec's File Exchange Manager is tailored for satellite transmissions, thereby optimizing the bandwidth required for the file transmission, while guaranteeing the file delivery through Forward Error Correction (FEC) and/or retransmission of corrupted or not received file fragments.

Unlike a linear transmission, a file transmission supports the use of variable and best-effort capacity. As such, it is able to always use the available bitrate up to the maximum capacity even if this bitrate changes during the transmission due to MODCOD changes in DVB-S2 ACM operation mode.

Moreover, in combination with opportunistic data insertion, the File Exchange Manager can efficiently mix a file transmission with a VBR live transmission. The File Exchange Manager in this case will throttle the file transmission throughput depending on the available leftover capacity.

Finally, in use-cases where several services like broadband access, IP telephony and video tranmission are sharing the same satellite capacity, the file exchange can adapt to any SLA it is configured with – be it a guaranteed or best-effort bitrate.

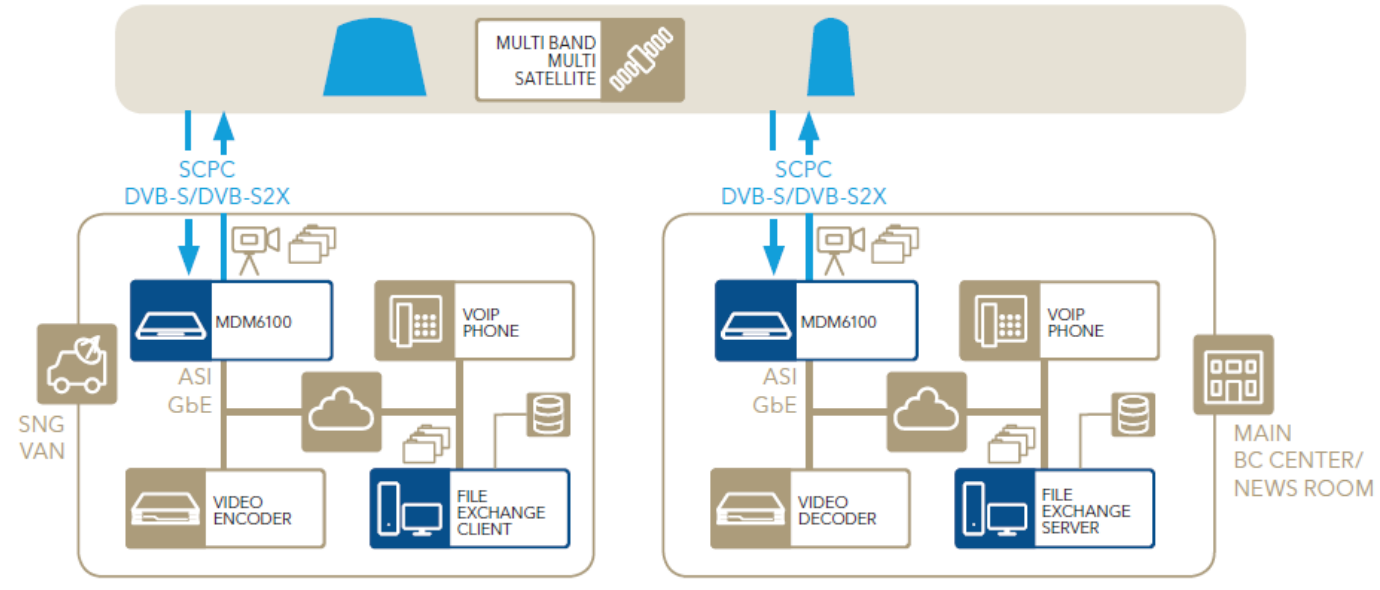

Figure 4: Interactive DSNG Operations, supporting live and file contributions

Automated Broadcast Workflows

The introduction of more complex, mixed linear and non- linear exchange workflows, the multi-format exchange of content and the adoption of emerging technologies like cloud services, create a lot of challenges for broadcasters needing to ensure reliable, error-free transmissions.

An important step to ensure error-free transmissions is **automating the broadcast workflows.** Dedicated workflow automation software allows the broadcaster to **control and automate the whole broadcast contribution process,** from content capturing to the final content production and post-production.

As part of this workflow, **automation of the transmission chain from SNG to studio is equally important**. Automating the satellite link setup **makes it possbile for non-skilled people to operate error-free SNG's or fixed terminals**. Additionally, it eliminates interference issues, as the automation logic will only grant transmissions in reserved and free space segment.

Automation of the satellite link setup and subsequent monitoring of the established link usually requires always-on connectivity between a central Network Management System (NMS) located in the news room or NOC and the remote broadcast equipment. The always-on connectivity additionally enables fault and performance monitoring of remote broadcast equipment.

Workflow automation goes hand in hand with the management of available space segment and satellite ground equipment. A session booking requires not only the selection of the right satellite ground equipment for the transmission, but also reserving free capacity for the duration of the transmission. The reservation of selected ground equipment and satellite capacity resources also ensures that the allocated resources are effectively available for the transmission.

The need for workflow automation and converged broadcast and IP services implies an end-to-end system approach to broadcast content exchange, whereby VSAT and SCPC technologies are merged into one single multiservice platform supporting always- on IP connectivity for the data and voice services, and assuring automated live and file-based transmission workflows.

The Newtec Dialog 'multiservice broadcast' system is designed to cover all these capabilities. The system supports SCPC based access methodologies for unidirectional low and high bitrate transmissions, ideally suited for FNG, SD and HD live streaming services, or for unidirectional file streaming. Additionally, the Newtec Dialog system supports MF-TDMA and Mx-DMA® based access technologies for bidirectional, always-on connectivity, suited for services like reliable file transmission, cloud service, or broadband connectivity.

The Newtec Dialog 'multiservice broadcast' platform is a single multiservice platform designed for supporting and automating mixed occasional use live and file broadcast workflows, in combination with always- on data and voice services.

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Automated FNG Live/File Contributions

A basic multiservice broadcast platform offers low bitrate FNG content exchange and low bitrate file transfers over always-on, star based, VSAT links, for covering breaking news events, for example. A typical flyaway Indoor Unit (IDU) will consist of a low cost IP encoder combined with a VSAT modem. This setup enables a broadcaster to use a very **cost-effective terminal solution for news events contributions to the news room**.

Low bitrate FNG transmissions are usually based on MF-TDMA access technology. The VSAT system needs to guarantee the Quality of Service (QoS) of the transmitted content by means of appropriate QoS settings. FNG content received by the hub can be forwarded for further distribution over the always-on forward link to other satellite connected remotes or can be forwarded to a news room facility connected with the hub through a permanent terrestrial connection.

The always-on connectivity provided by the Newtec Dialog hub supports a mix of FNG contributions, always-on VoIP and broadband connectivity on a 4CPM modulated MF-TDMA or a High Resolution Coding (HRC) modulated Mx-DMA return link between the remote terminals and the central news room. The always-on connectivity additionally facilitates automation of FNG transmissions initiated from the central news room and/ or management of a fleet of flyaway terminals.

ST Engineering iDirect's Point&Play® technology, available on the MDM3100 and MDM3300 modems, allows easy pointing of the flyaway terminal, ensuring quick deployment once the journalist is on site.

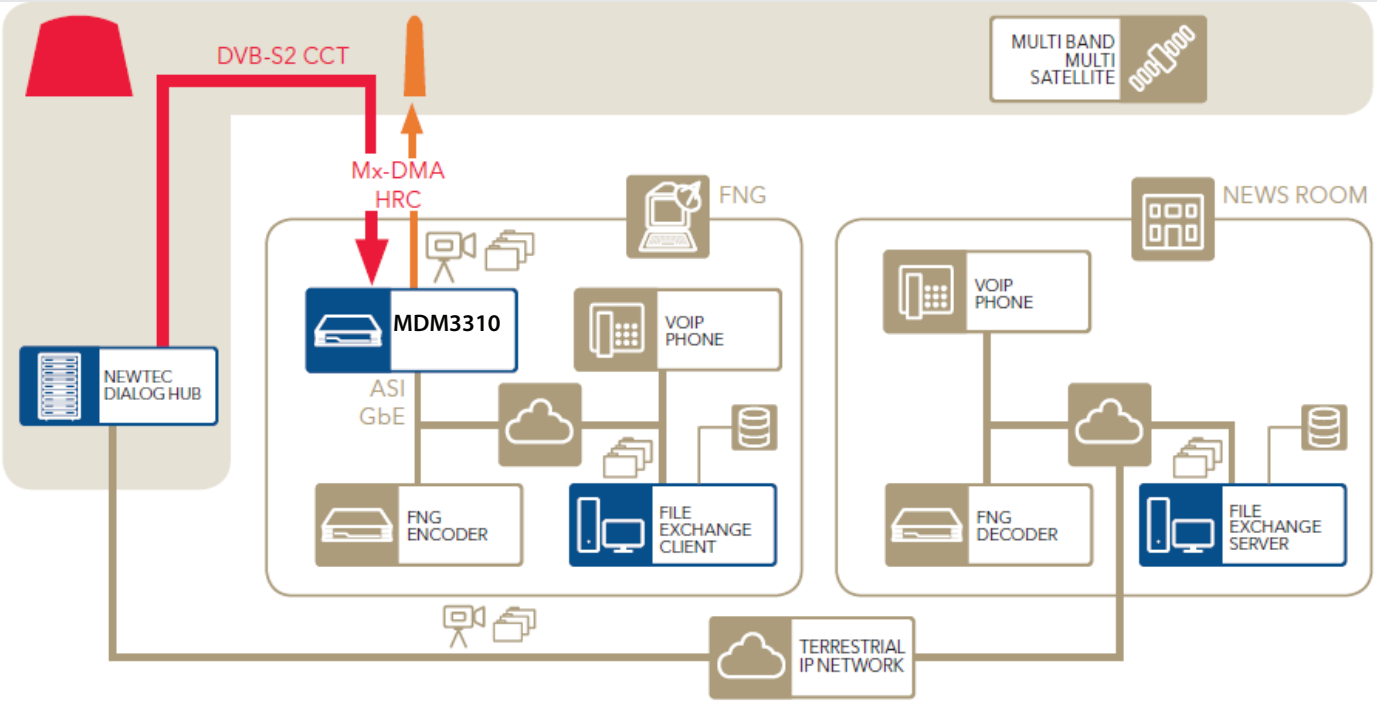

Figure 5: Automated FNG Live and file contributions

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Automated SNG Live/File Contributions

For high quality, high throughput SD/HD transmissions, high bitrate DVB-S2 modulated SCPC carriers can be set up, both in a star or a mesh topology. Mesh transmissions allow direct, single hop contributions from an SNG van to the news room, avoiding double hop transmissions. This enables **high quality, low delay and low jitter broadcast contributions**.

The same infrastructure can additionally support non-linear, file based content contributions. File exchanges can equally be transmitted over a DVB-S2 modulated SCPC carrier, provided the file exchange software supports file transmissions over a unidirectional link.

Typically, SNG live / file links are set up on an occasional use basis, making use of space segment that is shared among these services. Occasional use transmissions demand up-front scheduling to reserve the resources for the transmission. Thereby the system should ensure 'admission control' to avoid overbooking of the space segment. As such, the system avoids contention between the different services.

Automation of transmission links allows DSNG operations by non-technical skilled people, thereby avoiding human errors and consequently interference issues.

Automation also makes it possible to manage space capacity efficiently, ensuring only free space is allocated to the occasional SNG transmissions. The emergence of High Throughput Satellites (HTS) with, for example, roaming capabilities, will drive further need for automated space segment capacity management.

Automation of the transmission links usually require a narrowband, bidirectional link between the remote terminals and the central NMS for configuring the satellite ground equipment, either by means of an always on VSAT link or terrestrial connection.

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The Newtec Dialog platform can provide a very automated broadcast solution in combination with the MDM3310 modem and a low-cost SD/HD video encoder. In a default operational mode, the MDM3310 provides 4CPM modulated MF- TDMA carriers or Mx-DMA modulated Mx-DMA carriers for always- on connectivity. In addition, a DVB-S2 modulated SCPC carrier can be set up for an occasional live contribution. The MDM3310 modem can switch quickly between 4CPM modulated TDMA carriers, HRC modulated Mx-DMA carriers and DVB-S2 and DVB-S2X carriers, guaranteeing IP connectivity is maintained at all times, even during the switching from one modulation scheme to another.

The Newtec Dialog system supports both ad-hoc and scheduled transmissions. In both cases, bandwidth can be fully managed and controlled, and transmissions fully automated. This functionality is accomplished through an optional Newtec Dialog® software module: SATLink Manager.

This software module will ensure space segment and ground equipment resource allocation and reservation, service admission control and the automated setup and teardown of SCPC carriers and VSAT circuits. The SATLink Manager software module effectively enables **fully automated, error-free broadcast workflows.**

The File Exchange Manager is designed for satellite optimized file transmissions, supporting reliable file transmissions with guaranteed file delivery through FEC mechanisms and retransmission of lost file fragments. In combination with the SATLink manager, the bandwidth is managed in such a way that a transmission only starts if the required space segment for the SCPC carrier is available, thereby guaranteeing the required transmission bitrate (in-line with the defined SLA).

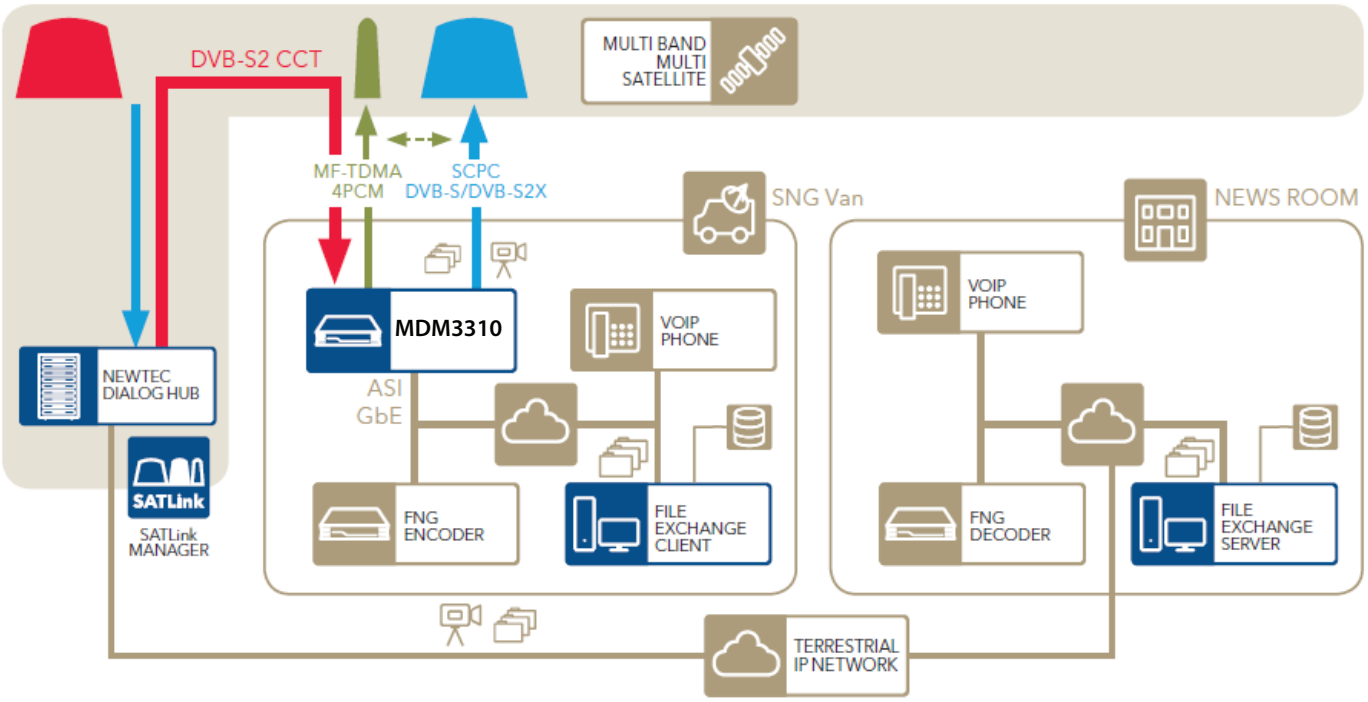

Figure 6: Automated live/file SNG operations

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Automated, High Quality Live & File Content Exchange

High quality HD transmissions for sports content exchange usually start off at bitrates of 20 Mbps. For these high quality occasional use content contributions and exchanges, the Newtec Dialog system can be equipped with the MDM6100 modems, ensuring high throughput, low delay and low jitter broadcast transmissions.

An automated multiservice broadcast system for high quality live and file exchanges, combined with low bitrate VoIP and data services, requires the combination of VSAT and SCPC technologies. This ensures both always-on low bitrate VoIP and broadband IP services over VSAT MF-TDMA links, as well as fully automated broadcast contribution and exchange services over SCPC carriers.

A multiservice broadcast system usually supports both mesh and star transmissions, whereby the specific choice of the topology is determined by the link budget characteristics of the remote terminal, the required end-to-end video delay and available bandwidth.

Single hop, mesh transmissions are ideally suited for high quality sports or events contributions, ensuring low delay transmissions between terminals with high powered Outdoor Units (ODUs). Double hop, star transmissions are usually chosen in case of a set up with low cost, low powered terminals, requiring an intermediate hub with high powered ODU's for reception and re-transmission to the destination terminals. Double hop transmissions are also ideal when flexibility is key in the broadcast operation: Terminals operating in different bands can still exchange content between each other, provided the hub is equipped with multiple band ODU's. Moreover, double hop transmissions allow centralized content inspection and interoperability with different encoding formats by means of hub based transcoding etc.

Increasingly, large broadcasters like broadcast unions or large satellite operators are deploying hybrid satellite / terrestrial networks, enabling the system to choose the optimal path depending on link availability, ingress/egress locations, congestion, cost, etc, thereby optimizing their OPEX and CAPEX costs.

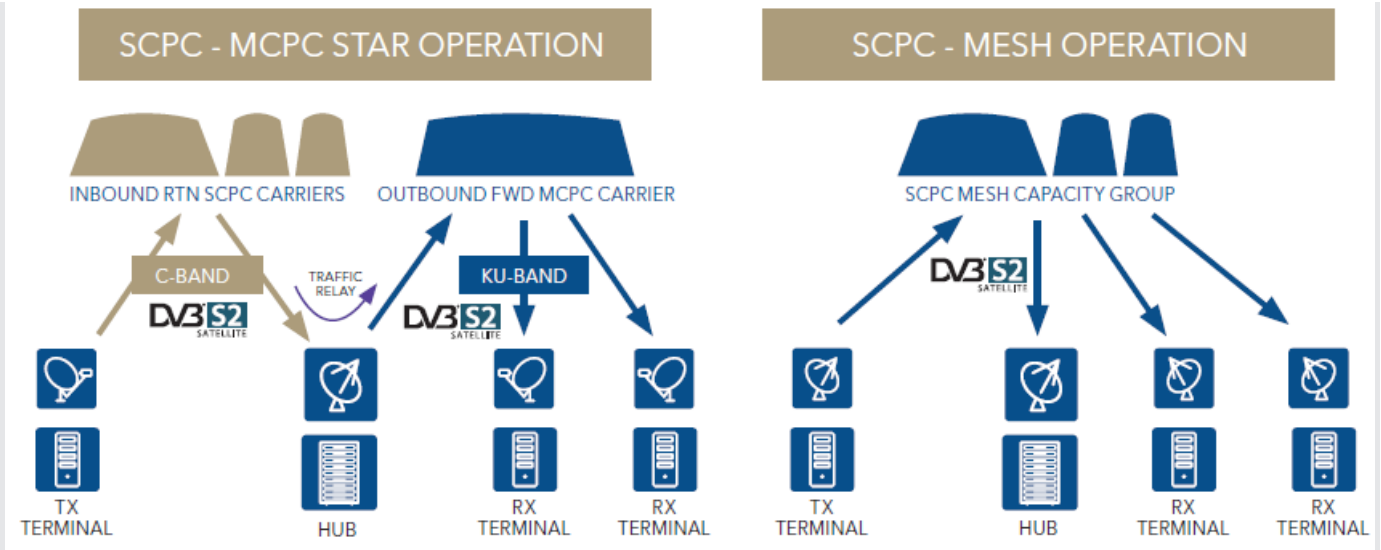

Figure 7: Star versus mesh topology

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The Newtec Dialog platform embraces all the features described here. It combines high throughput SCPC links with always-on VSAT connectivity. The VSAT connectivity is supported through the low-cost MDM3300 modem, while the SCPC connectivity is supported through the MDM6100 Satellite Broadcast Modem for broadcast exchange or the MDM6000 modem for high bitrate data / file exchange.

The Newtec Dialog platform can optionally be supplied with a flexible 'umbrella NMS', allowing customer specific workflows and Graphical User Interfaces (GUIs) to be defined. Additionally, the umbrella NMS can provide easy interfacing with third party broadcast software tools like a media asset management (MAM) tool or scheduling system. It can also provide the interface to the customer's OSS/BSS system, e.g. for accounting and/or billing purposes.

Obviously, the umbrella management system can also be used to

provide full element, network and service management, i.e. fault, configuration, accounting and performance management of the broadcast equipment elements, the end to end network path and the ongoing services.

Hybrid satellite / terrestrial workflows can equally be enabled by the 'same umbrella NMS', abstracting away the differences in connectivity between the different terminals, thereby offering a unified workflow and GUI for the content exchange, independent of the network topology.

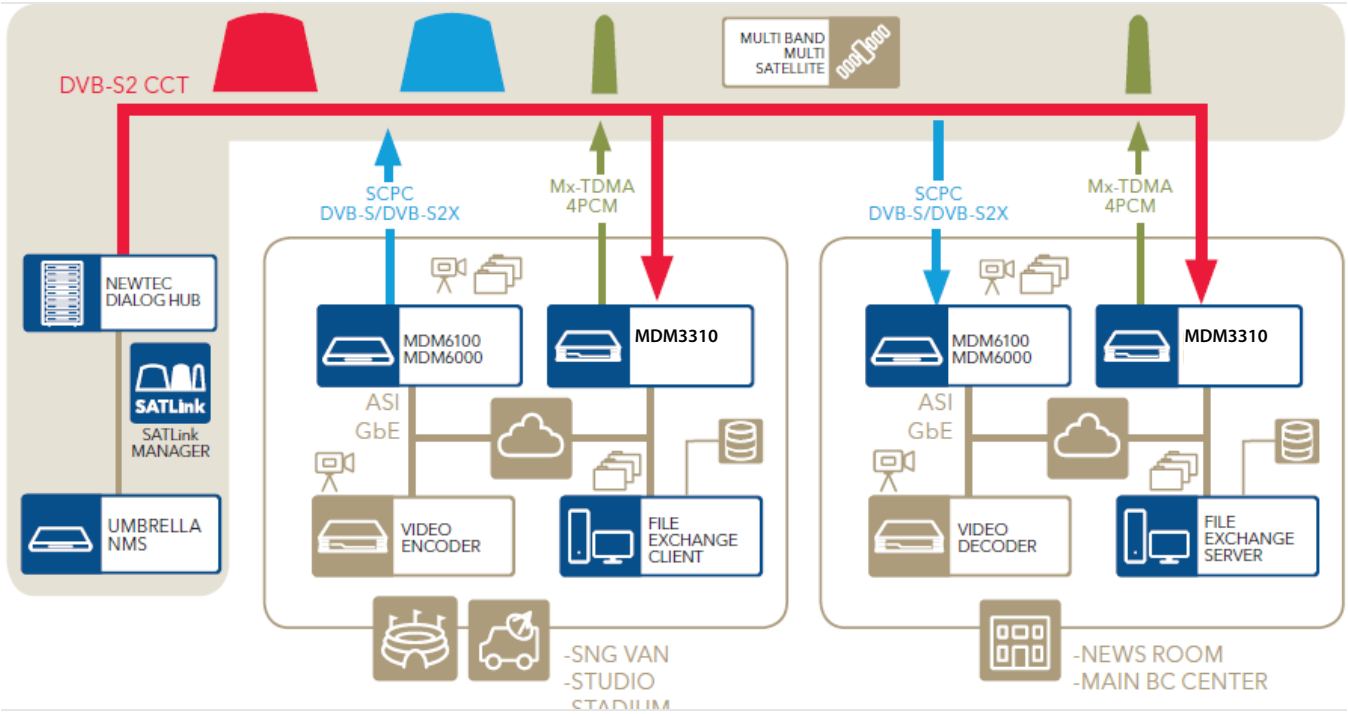


Figure 8: Automated live & file content exchange through always-on VSAT connectivity

Features and Benefits of the Newtec Dialog Platform for Broadcast Contribution Applications

The Newtec Dialog platform provides various connectivity features to serve the broadcast market:

- The Newtec Dialog platform combines both SCPC and VSAT connectivity, supporting multi, low bitrate data services over an MF-TDMA or Mx-DMA link, combined with high throughput linear and non-linear broadcast services over DVB-S2 SCPC links.
- The all IP infrastructure of the Newtec Dialog platform ensures multiplexing of multiple services on the same capacity.
- Support for multiple access technologies, modulation schemes and satellite ground equipment, providing the connectivity and associated QoS tailored to the service.

The **Newtec Dialog** offers some optional software components designed specifically for supporting **automated broadcast workflows:**

- SATLink Manager software module: Provides session and resource management and automated link setups for occasional use exchanges. Broadcast sessions can be booked from a central news room or booked decentralized by the terminal operator. The resource management functionality includes reservation based space segment and ground equipment resource allocation. Bandwidth can be booked in manual, slotted or in an optimized bandwidth mode.
  Manual bandwith allocation mode allows the broadcast operator to select specific satellite ground equipment and space segment resources for his session, slotted bandwidth allocation allows the operator to book specific frequency slots and optimized bandwidth allocation allows the system to autonomously determine the optimal selection of resources based on the service characteristics of the session.
  the SATLink Manager assures the admission control towards shared resources, guaranteeing broadcast sessions are 'on air' once resources have been reserved for the broadcast session.
  The SATLink Manager software allows flexible link topologies, including single hop (mesh based) and double hop (star based) links. Both reservation based SCPC carriers and MCPC channels are supported.
- The File Exchange Manager software product: A versatile product for the contribution, distribution and exchange of non-linear (aka non real-time) files. At its core, it uses the NOP1900/NOP1905 (former TelliCast) technology for the bandwidth-efficient, reliable and secure data transmission over IP satellite, as well as terrestrial networks.
  For the operation over satellite based IP networks, the product provides a set of features which optimize the transmission over that type of network, including admission control (requires SATLink Manager module), variable bandwidth support over DVB-S2 ACM links or even opportunistic IP data insertion. The transmission technology is based on the IPv4 (both unicast and multicast), TCP und UDP communication protocols.

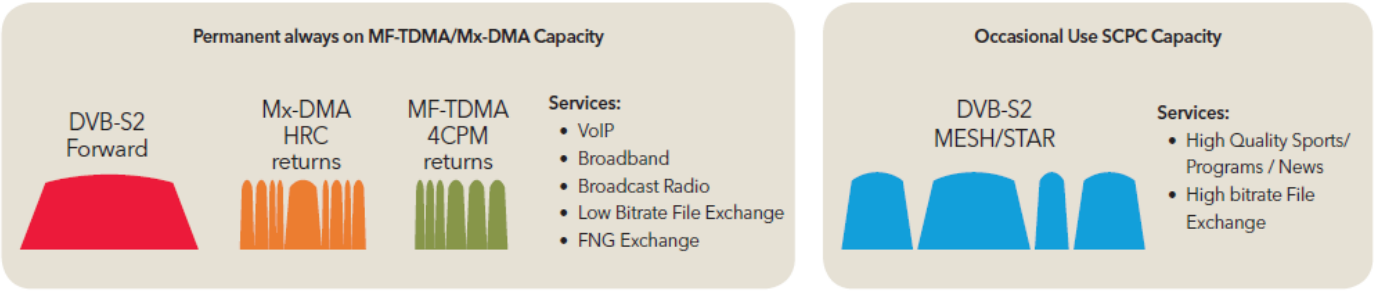


Figure 9: MF-TDMA / Mx-DMA based services and SCPC based services

- 'Umbrella NMS': Supports the implementation of specific linear and non-linear workflows and associated GUI's. Additionally, it supports the monitoring and control of non Newtec broadcast equipment, including ASI or IP based video codecs, video matrix switches, etc. It also ensures integration capabilities with external broadcast software tools, such as schedulers and media asset management tools.
  The umbrella NMS serves as the 'overlay' management system for managing disparate terrestrial / satellite networks and ensures end-to-end connectivity between terrestrial / satellite connected terminals.
  The umbrella NMS finally assures Virtual Network Operator (VNO) controlled access to VNO dedicated resources.

A full Dialog solution including SATLink Manager, File Exchange Manager and an umbrella NMS allows a lot of flexibility when it comes to managing complex broadcast workflows:
The ability to fully automate broadcast workflows guarantees 'hands-free' broadcast operations, avoiding human error and eliminating interference. Additionally, it allows fast coverage of 'breaking news' events.

- The ability to multiplex data and broadcast services on the same capacity, by 'time sharing' the same capacity for different contributions, or by supporting multiple services simultaneously on the same carrier.
- The support of multiple transport system on a single platform allows a broadcaster to select the most optimal transmission method for each supported service, thereby ensuring an optimal mix of CAPEX and OPEX.
- • Services can be defined with specific QoS features, allowing quality of service to be tailored to the needs of the specific service.
- The system is designed to customize the linear and non-linear workflows to the specific needs of the customer.
- The Newtec Dialog platform can be easily adapted to tailor it to the specific broadcast services needs.
- The support of a versatile modem portfolio allows the customer to pick and choose the right modem for each service.
- Support for multiple satellite bands and multiple satellites.

The Newtec Dialog platform has been designed from the ground up for scalability:

- The Newtec Dialog platform can support small to large networks, from a couple of terminals to multiple thousands of terminals.
- Up to four satellite networks, each with a separate forward, allowing single coverage, multi-coverage and multi-spot HTS.
- Scales seamlessly with the number of supported services and throughputs.
- The system is designed to deploy systems with low upfront CAPEX requirements and supports a licensing scheme, applying a pay as you grow philosophy.

The incorporation of all of ST Engineering iDirect's modulation schemes and access technologies into the Newtec Dialog platform allows for very efficient transmissions:

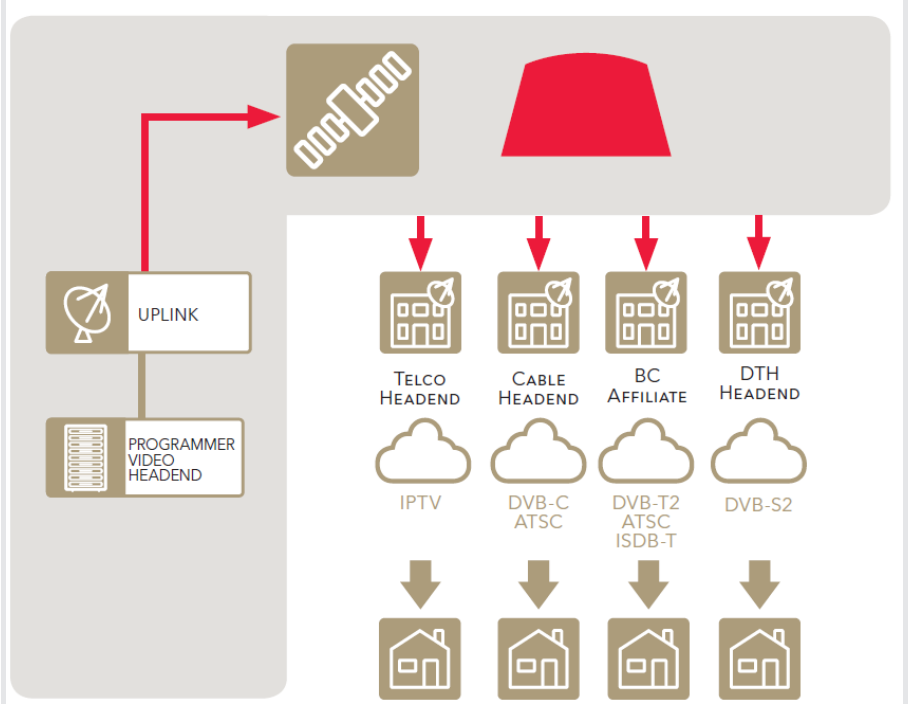
- DVB-S2/DVB-S2X, DVB-S2X SCPC return link
- DVB-S2 ACM forward link with low roll-off
- Optimized bandwidth allocation and statistical multiplexing
- Revolutionary HRC Mx-DMA return link provides MF-TDMA flexibility at SCPC efficiency for variable traffic
- 4CPM MF-TDMA return link for bursty traffic
- Cross-layer optimization from MHz to IP
- Ability to select the optimal modulation scheme and access technology for each service

Content is King

Content indeed drives pay-TV and advertising revenues. Hence the consumer demand for ever more content, consumed at a higher quality. Both the amount of TV channels and higher quality of those (HD and imminent Ultra HD), create the need to distribute more data over satellite. In many regions of the world, the required satellite capacity is not available, and if available, the capacity is sold very expensively along with long-term leases. In the recent past, many networks have upgraded from DVB-S to DVB-S2. The DVB-S2X standard results in yet another 15-30% efficiency gain in a typical distribution network. Combined with other advanced transmission technologies, such as Equalink 3® pre-distortion and DVB multistream operation, network optimizations can result in doubling the capacity at the same OPEX!

Content protection against theft (encryption), ad avail signalling transmission, and customer tiering and management are very important to protect revenues of all stake holders in the distribution chain. The transmission network needs to be able to transport the protection keys and additional metadata reliably, timely and transparently to the service providers' headends.

An increasing amount of TV channels, transmitted at higher quality, creates the need for a higher efficiency transmission. The DVB-S2X standard fuels growth in revenues and lower OPEX by up to 30%.



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Transparency in terms of video compression standards is not usually in place in today's networks. Very often, the receivers located in the service providers' headends only support one single compression format, namely MPEG-2 or H.264. The need for more efficient transmissions drives the evolution to new video compression standards continuously. However, any change in video compression standard requires a huge capital investment from the content providers, to upgrade all Integrated Receivers Decoders (IRDs) distributed in 100s or 1000s of headends globally.

While the industry is still in the process of upgrading networks to HD H.264, HEVC is already around the corner and will be required to distribute Ultra HD 4K content in a cost effective manner! The MCX7000 Multi-Carrier Satellite Gateway with its transmodulation capability gives the required decoupling between the satellite transmission and the video compression technologies.

Whilst in operation, the satellite link needs to be available at all times, protecting the operator's revenue streams. With respect to Service Level Agreements, reporting and documentation of actual operations are imperative.

Today's networks are generally uni-directional, meaning that **the content provider is blind to whether or not the content is well received and processed in the service provider's headend infrastructure!** On top of the uni-directional distribution of content and control of remote headend equipment, operators therefore see an increased need for a narrowband return channel with the remote headends to enable different monitoring applications, in-depth equipment control and even file transfers (non linear content, local ads, metadata).

Until today, such an infrastructure has been too expensive or operationally difficult using terrestrial (VPN) links. The solution set Newtec ST Engineering iDirect offers, lowers the barrier to entry on both CAPEX side and OPEX side.

Continuous (r)evolutions in video compression formats make a good case for deploying a satellite distribution network that is agnostic to the compression standard.

Cost-effective bi- directional monitoring over satellite creates visibility to the content owner of the local processing and ad-insertion in all remote locations or a subset thereof (e.g. one per digital market).

The primary distribution network needs to be transparent to

- Video and audio formats (SD, HD, Ultra HD, multi-channel audio)
- Video and audio compression standards (MPEG-2, H.264, HEVC)
- DVB and proprietary metadata and signalling information

Newtec iDirect

DIALOG® PLATFORM, M6100 AND MCX7000 ARE THE INDISPENSABLE TOOLS FOR A RELIABLE, EFFICIENT AND FUTURE PROOF TRANSMISSION SYSTEM

DIALOG

For traditional primary distribution, broadcast satellite M6100 Modulator and MCX7000 Multi-Carrier Satellite Gateway provide the level of uptime and the necessary **performance and features** to satisfy the most demanding operator. **Satellite transponder efficiency** is guaranteed by the DVB-S2X standard, reducing OPEX up to 30% in such distribution networks.

For operators in need of an interactive communication channel to remote locations, the **Newtec Dialog** platform provides a solution that is truly flexible in adapting the platform to advanced monitoring capabilities, facilitating linear and non-linear broadcast workflows, enabling multiple broadcast, telephony, file exchange and data services. **Newtec Dialog** is a real multi-service platform. At the same time, its built-in scalability features allow the system to be sized exactly to the customer's needs, ensuring an optimal CAPEX.

Last but not least, the ST Engineering iDirect solutions are **tested by major video headend solutions providers** including Arris, Cisco, Ericsson and Harmonic amongst others.

Newtec's M6100 Broadcast Satellite Modulator and MCX7000 Multi-Carrier Satellite Gateway

Newtec iDirect

Primary Distribution Satellite Link Improvements for Existing Networks

Legacy satellite broadcast primary distribution is using DVB-S, DVB-S2 and DVB-S2X modulation. With the M6100 Broadcast Satellite Modulator in the uplink station, satellite link efficiency can be improved by enabling ST Engineering iDirect technologies, such as Clean Channel Technology® and Equalink® 3 pre-distortion, which are both available as a software license key.
Clean Channel Technology allows for reduced roll-offs as small as 5%. Through advanced filtering technology, the carrier spacing can be reduced to up to 1,05 times the symbol rates, resulting in an immediate bandwidth gain of up to 15%. Professional IRDs on the market support smaller than 20% roll-offs.

Equalink® 3 predistortion has been fully automated. It can lead to up to 10% bandwidth efficiency gain in a single carrier per transponder set-up, while pre-serving interoperability with any DVB-S/S2/S2X receiver, IRD (and set top box).

In practice, customers can use this efficiency to add more video channels to a transponder at the same cost, add more HD channels, grow their geographical footprint and increase service availability.

A further benefit is that the M6100 can be configured to inject a Carrier Identifier (DVB-CID), helping to reduce the impact of RF interferences on the satellite.

The M6100 interoperates with all market leading video headend systems and is transparent for encryption systems and video compression formats. To simplify installation, the M6100 supports ASI as well as Gigabit Ethernet Interfaces for hooking up IP based encoders or multiplexers. Data can be transmitted from the uplink to the IRDs (e.g. software or configuration updates, private data) using the built-in MPE transport capability of the M6100. This MPE inserter is very efficient, replacing NULL packets in the video stream with valid data packets (opportunistic data insertion).

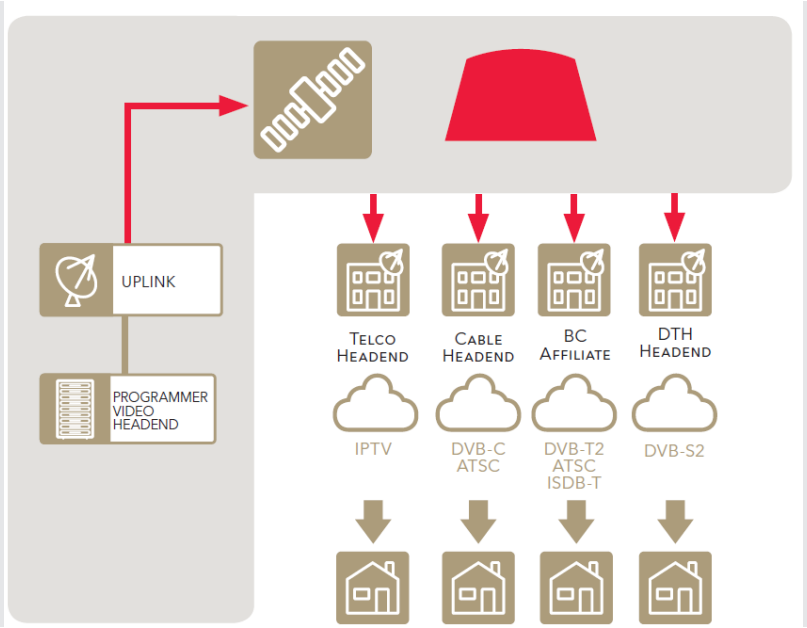

Figure 2: Broadcast primary distribution to headends

Enabling the higher efficient transmission only requires the matching software licenses on the M6100 in the uplink. No changes in the installed base of IRDs is required.

Highly Efficient Primary Distribution enabling more SD and HD content. Be prepared for Ultra HD

Additional efficiencies in transmission can be achieved by further optimizing transmission technologies. By deploying a dedicated MCX7000 Multi-Carrier Satellite Gateway in the remote sites, to act as a single frontend to the installed base of IRDs, the operator can enable a lot of new transmission technologies, such as DVB-S2X, Multistream and Wideband up to 72 MBaud.

Combinations of one or more technologies can result in additional throughput of over 100% - using the more efficient DVB-S2X, Equalink® 3 pre-distortion in the uplink, and saturating the transponder with a single multi-stream and 72 MBaud carrier. As a result, the operator can either distribute more and higher quality programs in the same bandwidth, or save OPEX by reducing the leased satellite capacity.

Supporting higher transmission efficiency enables cost- effective HD, or 4K (UHDTV) transmissions, without compromising on availability and reliability. These gains, which can be up to 37% for 64APSK can be realized through use of DVB-S2X.

DVB-S2X is a open standard which allows for interoperability and avoids vendor lock-in.

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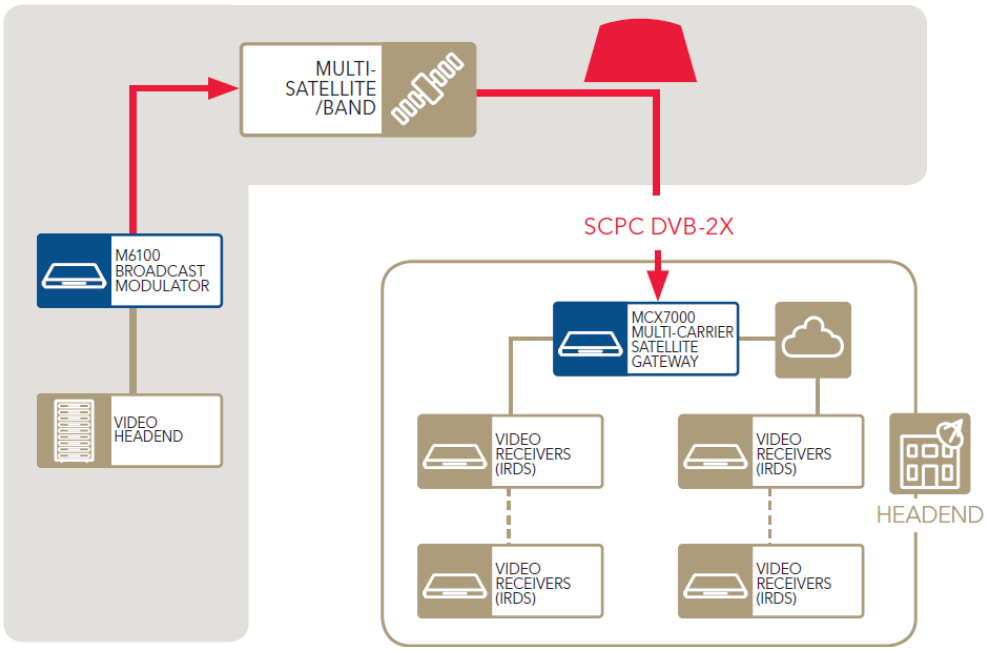


Figure 3: Broadcast primary distribution to headends

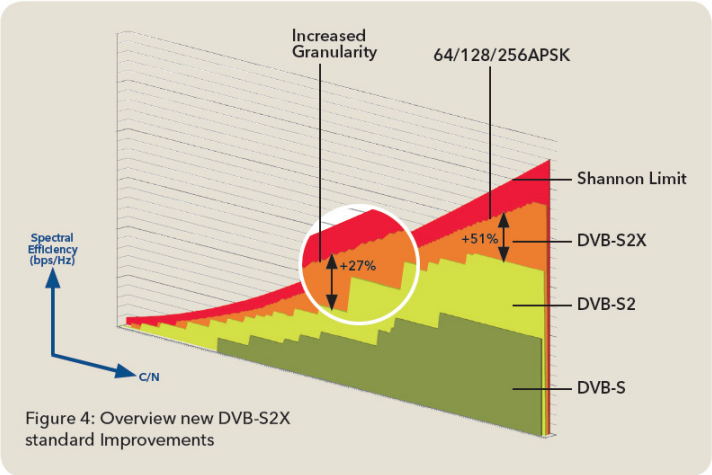


Figure 4: Overview new DVB-S2X standard Improvements

10 Improvements in DVB-S2X

- Smaller roll-offs
- Advanced filtering of satellite carriers
- Increased granularity in MODCODs
- Higher order modulation: 64/128/256 APSK support
- Linear and non-linear MODCODs
- Better implementation of MODCODs
- Wideband support
- Very low SNR support for mobile applications
- Channel bonding
- Additional standard scrambling sequences to mitigate co-channel-interference (CCI)

Bonding multiple carriers together into one big virtual carrier, increases the efficiency gains of the video statistical multiplexed by up to 20%. This will ultimately be a key technology to distribute statistical multiplexed Ultra HD streams containing ten or more TV channels in one transport stream of 160-220 Mbps.

Multistream (DVB MIS) capability allows operators to aggregate a number of independent transport streams or IP streams into one carrier in a fully transparent manner, maintaining the integrity of the original content.

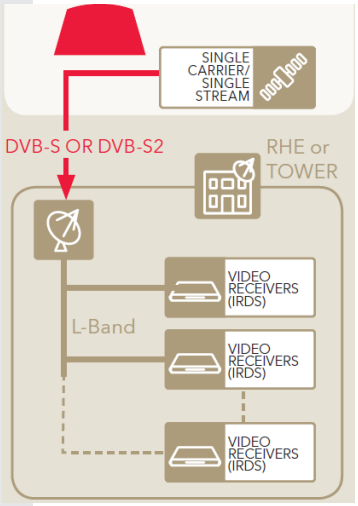
Wideband transmission provides these aggregated streams to be up to 72 MBaud, resulting in one large single carrier to be transmitted over satellite. This allows the operator to saturate the transponder, thereby increasing the efficiency with up to 20% through non-linear operation.

Newtec iDirect

DO YOU KNOW THAT YOU CAN BENEFIT FROM HIGHER TRANSMISSION EFFICIENCY WHILE PRESERVING YOUR INSTALLED BASE OF IRDS?

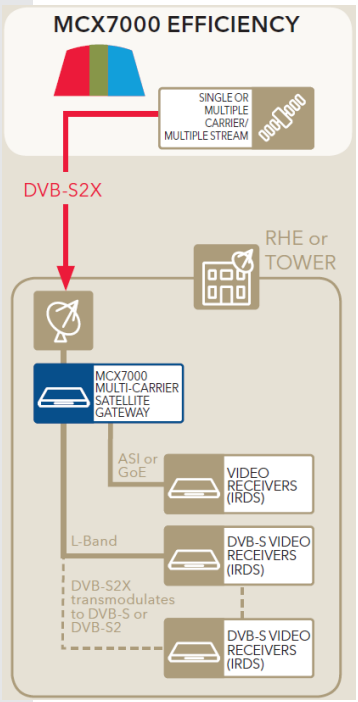
The upgrade of a network from DVB-S to DVB-S2 or DVB-S2X is generally perceived to be very expensive. Indeed, the installed base of IRDs represents a high CAPEX because the IRDs contain multiple functions in one box:

- **L-band satellite reception inputs (DVB-S and/or DVB-S2)**
- **optional GbE and ASI inputs**
- **transport stream decryption**
- **in-band controls**
- **video/audio decoding and transcoding (MPEG-2 and/or H.264)**
- **metadata processing (e.g. cue tones)**



Combining all those functions together in a single box makes the transition to new technologies and standards difficult. In practice, network upgrades are done late in time, at the point where multiple new technologies converge together. As an example, large network upgrades have been triggered by a combined upgrade to High Definition + H.264 + DVB-S2. The business case to roll out new and upgrade existing networks (IRDs) to these new technologies, made sense by combining the benefits of all 3 new technologies together into one investment round. This is of course the result of the fact that IRDs combine all three functions together in a single box.

The MCX7000 Multi-Carrier Satellite Gateway is ideally suited to benefit from a higher efficient transmission in existing networks, or to prepare the network for future upgrades to new video standards. Operators can benefit instantly from higher efficient transmission, while preserving the investment for future upgrades to HEVC and Ultra HD.



The alternative that exists, is to split the different functions in multiple boxes. Depending on the number of channels received per headend, which is ever increasing – it makes economic sense to upgrade the satellite transmission network to a higher efficient transmission using DVB-S2X, while upgrading to HEVC and possibly Ultra HD can be done at a later stage. In this way, distribution networks can instantly benefit from a higher efficient transmission, opening the door to either

- **using less transponder space**
- **distributing more channels without buying more satellite capacity**

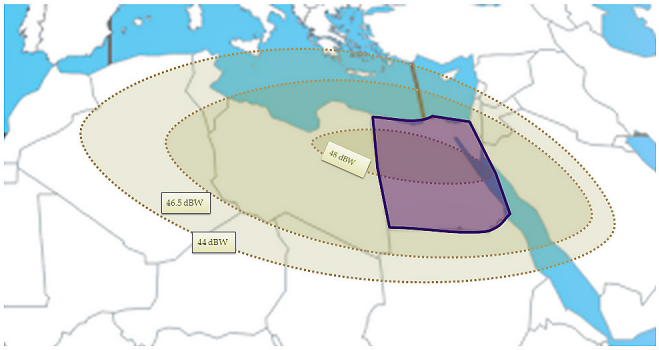
The MCX7000 Multi-Carrier Satellite Gateway ideally fits as a satellite front-end feeding multiple IRDs. The MCX7000 receives multiple MPEG-2 transport streams from a single or multiple saturated transponder(s) using DVB-S2X. It then extracts those transport streams and feeds them over ASI or IP into the existing installed base of IRDs. One MCX7000 can be used for tens of TV channels. In case older IRDs have no ASI nor IP input, the MCX7000 can even transmodulate the DVB-S2X multistream carrier into a traditional DVB-S/DVB-S2 singlestream carrier!

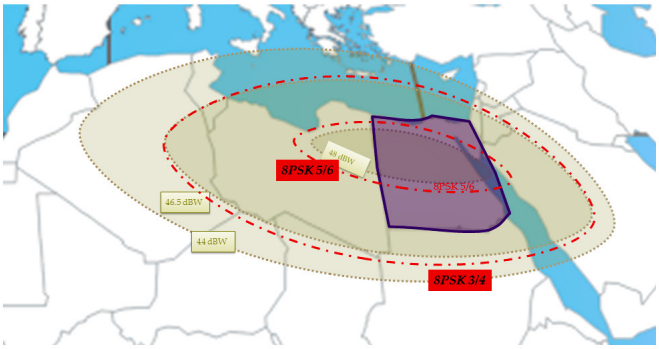
Newtec iDirect

DO YOU KNOW THAT THE HIGHER MODCOD GRANULARITY ALLOWS YOU TO MATCH THE SATELLITE FOOTPRINT OPTIMAL TO THE GEOGRAPHIC REGION?

Assume the following example:

We want to cover the purple region with a satellite distribution system. The satellite EIRP is depicted on the map and is determined by the transmission efficiency, service availability and size of the satellite terminal.

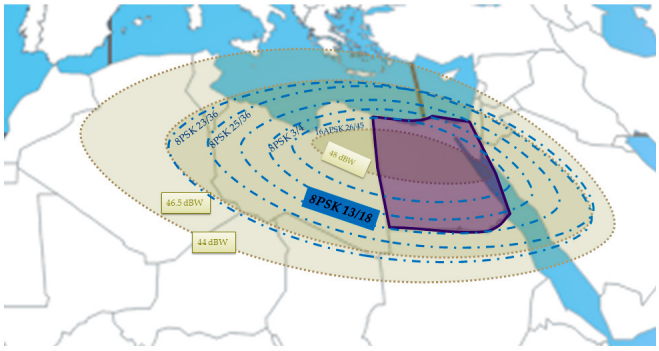




Using **DVB-S2 20%** roll-off, 8PSK 3/4 is the best match to achieve a defined availability with a certain terminal size. The higher modulation 8PSK 5/6 cannot be used since the full geographic region is not covered.

Using DVB-S2X with a higher MODCOD granularity, allows the selection of 8PSK 13/18 modulation to much better match the target footprint. This MODCOD results in 16% bitrate gains compared to DVB-S2, without compromising service availability!

Alternatively, customers can opt to achieve the same bitrate from DVB-S2X as DVB-S2, while benefitting from smaller dish sizes!



Newtec iDirect

Interactive File Multicasting and Unicasting

In order to meet SLAs, primary distribution operators become more and more interested in monitoring capabilities of the remote locations in addition to being able to control them. Reporting capabilities of revenue generating events is very important, such as actual broadcasting reports of ad insertions or even full broadcast confidence monitoring per region.

THE BI-DIRECTIONAL VSAT SATELLITE LINK

Low bitrate transmissions such as monitoring and control, and VoIP services are usually based on VSAT MF-TDMA.

access technology. This always-on connectivity provided by the Newtec Dialog platform supports a mix of always-on broadband and VoIP connectivity on a 4CPM MF-TDMA return link between the remote terminals and the central playout, guaranteeing the QoS of each of these services through per service QoS settings.

The narrowband link requires a very low amount of satellite capacity consumption, while the cost of the terminal is very affordable starting at just a few hundred dollars!

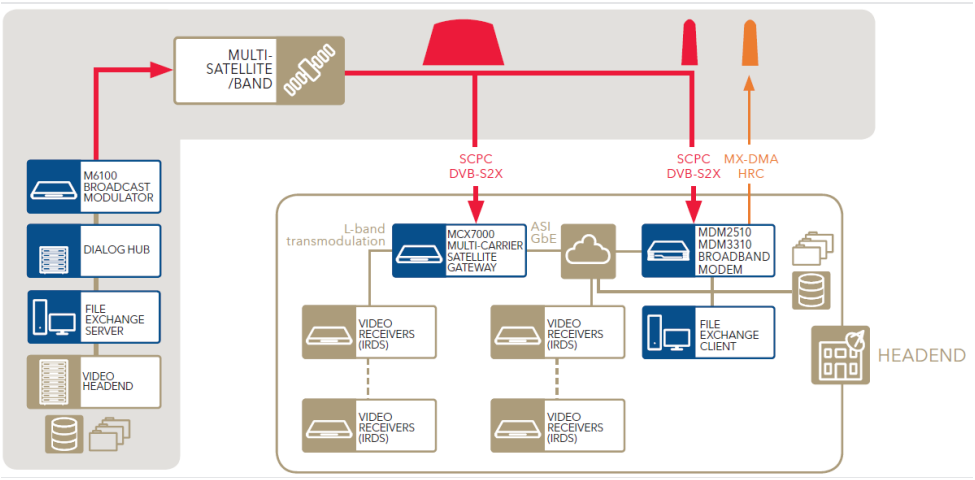


Figure 5: Broadcast interactive primary distribution to headends

BENEFITS OF NEWTEC'S ST ENGINEERING IDIRECT'S TECHNOLOGIES FOR BROADCAST INTERACTIVE PRIMARY DISTRIBUTION

FLEXIBILITY

- Breadth of choice for satellite RF interfaces as well as audio/video interfaces
- Agnostic to video compression technology (MPEG-2, H.264, HEVC)
- Agnostic to video format (SD, HD, Ultra HD ready)
- Supports video, audio and data distribution and exchange
- Integrated with all leading manufacturers of video headends and distribution systems (Cisco, Arris, Harmonic, Ericsson, etc..)

Interactive File Multicasting and Unicasting

Assuming bi-directional connectivity is in place, the same Newtec Dialog platform can be used to facilitate file multicasting from the central playout to the headends and file unicasting from the headends back to the central playout. This opens up the classical video live distribution network for new technologies such as distribution of files for VoD, ads, video clips, etc. The return channel can be used for backhauling video files from regional headends.

The File Exchange module provides the operator with a tool to transfer file based content error-free and is conceived as a software product that can support various use cases typically found within satellite broadcasting, serving a broad range of point-to- point and point-to-multipoint applications.

The File Exchange module is designed for satellite optimized file transmissions, supporting file transmissions over a unidirectional

link with guaranteed file delivery through FEC mechanisms and retransmission of lost file fragments.

The Newtec Dialog platform can provide a very cost effective solution with MDM2510 Modem and MDM3310 Modem. These modems provide 4CPM and HRC modulations used in a MF-TDMA or Mx-DMA™ access mode for always-on connectivity.

Mx-DMA is the return technology that incorporates the best features of MF-TDMA and SCPC technologies, solving the difficult choice of selecting one or the other. MF-TDMA is ideally suited to provide broadband access for monitoring and control to large populations of remote headends. Mx-DMA is ideally suited to provide larger bandwidth from the remote headends towards the broadcast uplink enabling, for example, file transfers.

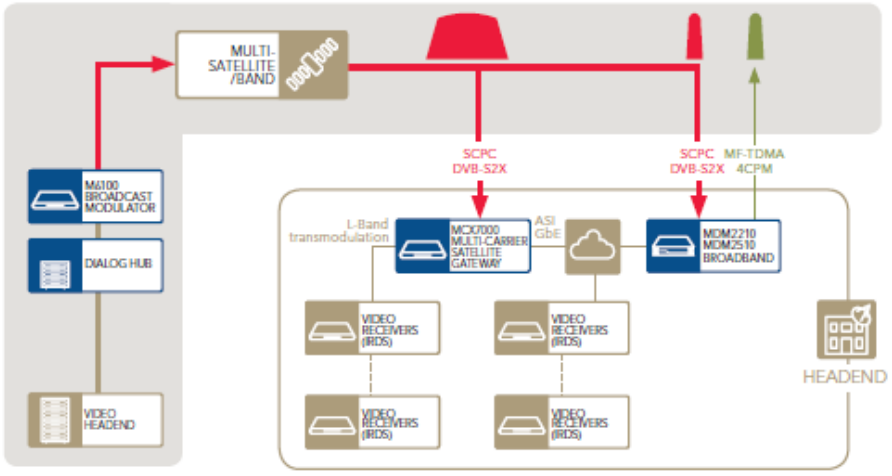


Figure 6: Broadcast interactive primary distribution to headends

SCALABILITY

- Turn a traditional distribution network into a more efficient interactive distribution network while preserving installed base of infrastructure
- Re-use existing IRDs in all growth scenario's, including NMS and encryption:
- no operational changes
- Add file distribution and exchange to traditional live distribution

EFFICIENCY

- Use highest modulation efficiency including SW upgrade to DVB-S2X
- Clean Channel Technology works with a lot of professional receivers up to 10% roll-off
- Full transponder saturation with DVB multistream
- Efficient transponder utilization using linear and non-linear Equalink® 3
- High performing and patented demodulator : better link margin and RFI resilience compared to silicon based IRDs
- Fast troubleshooting of video headend using real-time transport stream analyzer in all modulators