### Newtec

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### DIRECT TO HOME (DTH)

Hans Massart Market Director Broadcast

November 2016



Shaping the Future of Satellite Communications

### DIRECT TO HOME (DTH): **GROWING & DYNAMIC MARKET**

#### **Global DTH Channels, SD**







14,000

12,000 10,000

<u>\$</u>8,000

000,9 June

4,000

#### **Global DTH Channels, 3D**



#### DTH remains a sector with strong growth gains ahead

- UltraHD to become a significant driver
- HD channel strongest migration, but SD channels strongest addition. .
- OTT not a major threat until end of the forecast, except for USA, West-Europe and East Asia. ٠
- Additional \$1.5B in leasing revenue from DTH generated by 2024 compared to 2014
- Small handful of channels being distributed via HTS beams •

Source: NSR, Linear TV via Satellite: DTH, OTT & IPTV, 8th Edition

#### **Global DTH Channels, HD**



#### **Global DTH Channels, UHD**



Ded. GEO-HTS Ku-band UHD Channels Ku-band UHD Channels



### DIRECT TO HOME (DTH): **GROWING &** DYNAMIC MARKET

Worldwide Households: 2020: 439 M Up 70 M <> 2014



Source: Digital TV Research Ltd

One quarter of total homes = Satellite



### DIRECT TO HOME (DTH): CHALLENGES

### **SUBSCRIBER EXPECTATIONS ARE RISING:**

- More content
- Higher video quality (all resolutions: sports, movies, etc.)
- Migration from SD to HD channels
- Addition of Ultra HD channels

### THE CHALLENGE

- Increase space segment to handle growing bandwidth requirements.
- Migrate installed base of set-top boxes (STB) in order to handle Ultra HD.
- Differentiate offering from OTT providers.





### DIRECT TO HOME (DTH): CHALLENGES

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H.265 - HIGH EFFICIENCY VIDEO CODING

## DBS2X®

# **Evolutions of resolution, coding and modulation efficiency improvements go hand in hand.**





### DIRECT TO HOME (DTH): SOLUTIONS

Focus on video quality for premium channels

- At bitrates above the average ISP connection •
- For HD & Ultra HD channels

Focus on ultimate transmission efficiency

Efficiency improvements can be stacked:

- For an installed base of legacy STB
- For next generation STB.

UHD? Not without HEVC and DVB-S2X capabilities!



| EFFICIENCY                  | STACKING<br>EFFICIENCY<br>IMPROVEMENTS                           | RECEPTION<br>EQUIPMENT<br>IMPACT                  | BEN                        |
|-----------------------------|--|---|----------------------------|
| DVB-S2X<br>Channel Bonding  | ~20% MORE EFFICIENT<br>CHANNEL BONDING                           | NEXT GENERATION IRD<br>OR<br>TRANSMODUL ATOR      | • M<br>• Hi<br>• In        |
| HEVC                        | ~50% MORE EFFICIENT<br>COMPRESSION                               | NEXT GENERATION STB                               | • Sa<br>• Lo<br>• In<br>(d |
| DVB-S2X<br>Extended MODCODs | ~37% MORE<br>THROUGHPUT<br>(DTH: 20%;<br>Prof. Applications 51%) |   | • Ro<br>of                 |
| Clean Channel<br>Technology | ~15% MORE<br>THROUGHPUT  | INTEROPERABLE<br>MAJORITY OF<br>INSTALLED BASE OF |                            |
| Equalink<br>Predistortion   | ~10% MORE<br>THROUGHPUT  | IRDS & STBS                                       |                            |

#### IEFITS:

igher Link Margin lore Channels igher Picture Quality icrease footprint

ave money on space capacity ower programming cost acrease service offering decrease customer churn) each more users (on the edges f the satellite footprint)



### SATELLITE COMMUNICATION LINK





### GETTING THE MAXIMUM OUT OF THE TRANSPONDER: **DVB-S2 OPTIMIZATIONS**

Fill BW optimally Decrease Roll-off Factor

- Imperfections of the amp
- Linear distortions can the



### EQUALINK<sup>®</sup>3 A NEW TOOL TO ENHANCE DTH AND PRIMARY **DISTRIBUTION OVER SATELLITE PERFORMANCE**



- AM/AM and AM/PM non linearities lead to higher order distortions
- Non-Linear distortions can only be 100% compensated for at transmitter







### WHAT IS NEW IN EQUALINK 3?

#### New features

- Equalink® 3 is the third generation of Newtec's linear and non-linear predistortion technology. It compensates for the effects of imperfections in the filters and amplifier of the satellite transponder.
- Linear pre-distortion pre-corrects amplitude and group delay variations over frequency caused by the transponder filters, while non-linear pre-distortion compensates for the transponder amplifier AM/AM and AM/PM distortions. The result is a better link margin or higher throughput over satellite.
- Better performance in the non-linear predistortion for DVB-S2 QPSK and 8PSK
- Ease of calibration
- Satlink Analyser, as part of the calibration, gives indication of the optimal transponder amplifier operating point



### LINEAR PRE-DISTORTION









#### **NON-LINEAR PRE-DISTORTION**







### AUTOMATED CALIBRATION





Newtec Proprietary – Internal Use Only



Without pre-distortion



With pre-distortion







### **BENEFITS FOR** DTH PROVIDERS

- Up to 15% Efficiency Gain in 8PSK •
- More SD and HD Channels •
- Higher availability •
- Better geographical reach •

#### DVB-S2/DVB-S2X

QPSK 8PSK 16APSK 32APSK 64/128APSK 256APSK

| Link margin      |  |  |  |  |
|------------------|--|--|--|--|
| improvement (dB) |  |  |  |  |
| up to            |  |  |  |  |
| 0.4              |  |  |  |  |
| 0.6              |  |  |  |  |
| 1.5              |  |  |  |  |
| 2.5              |  |  |  |  |
| 4.0              |  |  |  |  |
| 5.0              |  |  |  |  |



### CLEAN CHANNEL TECHNOLOGY

- RO 5% 10% 15%
- Spectral Shape MER > 42 dB
- $\bullet$
- Avoids interferences  $\bullet$
- Spurious suppression

**Clean Channel Technology**®

DVB-S2 Roll-Off to 5% or 10% or 15% RO 5% RO 20% RO 20% RO 5%

Low Roll-Off: 5/10/15%



**Optimal Carrier** Spacing

Backwards compatible with many STB.

#### **Shared Transponder** Support



### DVB-S2X

Summary High Level changes

- Smaller Roll-Offs,
- **Advanced filter technologies**
- **Increased granularity in MODCODs**
- **Bonding of TV streams**
- Wideband





### DVB-S2X

#### Summary High Level changes





DVB-S2X

#### Also applicable for DTH !!!

#### Example setup







- Requested coverage (Egypt)
- EIRP footprint definitions



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- EIRP footprint definitions
- DVB-S2 (27.5Mbaud; 25% RO) specific contours for 99.5% availability



- Requested coverage (Egypt)
- EIRP footprint definitions
- DVB-S2 (27.5Mbaud; 25% RO) specific contours for 99.5% availability
- DVB-S2X (33Mbaud, 10%RO) specific contours for 99.5% availability

## 16% higher bitrate

Or smaller dishes !

### **CHANNEL BONDING**

### DVB-S2X

#### Bonding of DVB-S2X carriers

- Combine multiple carriers as if they are one
- Allow more UHDTV channels on MPEG transport streams into one logical carrier
  - Gains up to 20% in statistical multiplexing  $\bullet$
  - All receivers must take in all carriers of the bond  $\bullet$
  - Uses ISSY based on the symbol rate of the master S2X carrier for  $\bullet$ synchronisation



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#### **CHANNEL BONDING CALCULATION: Example**



### **UHDTV channel** ~ 20 Mbps

#### No Bonding

- 3 channels in 1 TPX (60 Mbps)
- 9 channels = 3 TPX

With Bonding:

11 channels in 3 TPX

Gain of **22%**  $\rightarrow$ 



### WIDEBAND TRANSPONDERS

### DVB-S2X

#### Wideband & **Statistical Multiplexing**



(C = max(A) = max(B))

### DIRECT TO HOME (DTH): TRANSPORT STREAM ANALYSIS

### What if you cannot decode the video?

...only with Newtec's **Transport stream Analyzer** in the modulator you really know what information is on satellite







### DIRECT TO HOME (DTH): NEWTEC'S SOLUTIONS

#### What if you cannot decode the video?

- Measure at the right place in the network ... the modulator ! • Unlike traditional probes, the built-in TS analyzer does not change network characteristics during analysis
- Measures & alarms upon DVB TR 101 29 errors that can occur between video • mux & uplink Prio\_1: Transport\_Stream\_Sync\_Loss, Sync\_byte\_error, PAT\_error, Continuity\_count\_error Prio\_2 : TS\_Error\_indicator, PCR\_repetition\_error, PCR\_disc\_error, PCR\_accuracy\_error

 $\blacktriangleright$  Alarms can be used as triggers for redundancy switching

- Transport Stream Rate measurement
- Detects and lists PIDs including unreferenced PIDs



### Migration to full IP Head-end



#### **Benefits**:

- Cost efficient
  - Enable the implementation of a full IP Head-end
- Lowering operational activities & increased flexibility
- M6100 supports TSoIP redundancy requirements for all network topologies •
- Integrated support for MPE data
  - Enable software downloads to STB, push-VoD, etc...



### Full Head-end solutions: Protection scheme's for highest uptime



- Predictable
- Easy operation
- Reliable Service Changes



#### **Alarm Triggers**

- Input Source Failure
- Equipment malfunction (power, T°)
- User-Configurable (enable/disable/debounce)
- Alarms communicated via alarm contacts and/or Redundant Ethernet

#### **Switchover Controls**

- Automatic or manual switch-over and restore
- Manual override via frontpanel or mgt port
- Automated settings copy/paste
- N+1 operation also available





### DIRECT TO HOME (DTH): NEWTEC'S EQUIPMENT

M6100 Broadcast Satellite Modulator  $\bullet$ 



MDM6100 Broadcast Satellite Modem lacksquare



MCX7000 Multi-Carrier Satellite Gateway



USS0202/USS0212 Modulator Redundancy switch



FRC07x0 Converters & Combiners lacksquare







# MCX7000











**Maximal flexibility multi-stream solution** 



S2X wideband 133Mbaud modem



Contribution networks



Distribution to towers



Studio-to-studio exchange



**Direct-to-home** 



### **Flagship modem within Dialog MS-BC solution**



### NEWTEC MCX7000

#### **MULTI-CARRIER** SATELLITE GATEWAY

### MCX7000 PLANNING

- Multi-Carrier Satellite Gateway ullet
- DVB-S, DVB-S2, DVB-S2X and Newtec S2 Extensions ullet
- From QPSK up to 256APSK modulations
- Baudrate range from 50 kbaud up to 133 MBaud
- 1 to 4 carriers in Tx, Up to 6 carriers in Rx or Dual Modem
- Transmodulation
- IF and L-band interfaces
- Best in class spectral purity (MER) ullet
- NIT and DVB (RF) Carrier ID •
- Highest efficiency over satellite with CCT<sup>®</sup> and Equalink<sup>®</sup> 3
- Built-in Transport Stream Analyzer with alarm triggers •
- Flexibility in data interfaces, ASI or TSoIP
- Redundancy support on input and output interfaces
- Temporary licenses
- Over the air control and software upgrades ullet



### MCX7000 MULTI-CARRIER SATELLITE GATEWAY



The MCX7000 has a Front Panel. Using the Front Panel it is possible to set the IP-address. The behavior of the LEDs is similar to the M6100.



Flexibility in back panel lay-out With or without ASI interfaces





### MCX7000 Multi-Carrier Satellite Gateway



### **OPTIONS:**

- 3 CARRIER DEMODULATOR
- MODEM WITH DUAL RECEIVER
- 4 CARRIER MODULATOR
- MODEM WITH DUAL MODULATOR





### MCX7000 REDUNDANCY

- Fully exploit the Multistream Product in a Multicarrier Redundancy scheme.
- Protect against single failure.
- Minimise switchover considering that:
  - Input signal failure happening much more often than device failure.
  - Device failure is **very** rare.
  - USS failure even rarer. •
- MCX 7000 architecture supports Input Signal and Device alarms.



### MCX7000 R2.0 Direct-to-Home with 1+1 carrier redundancy

#### Traditional Way Of Working

- Primary and Secondary duplicated by switches
- Modulator takes two signals
- USS makes sure device is switched
- Sometimes complex failure modes or behavior





### MCX7000 R2.0 Direct-to-Home with 1+1 carrier redundancy

### Simplified set-up with signal routing from secondary to primary

- FP1: Secondary takes over
- FP2: Primary keeps running
- FP3: Primary keeps running
- FP4: Primary keeps running
- FP5: Primary keeps running
- FP6: USS switches to secondary device
- At any failure scenario the signal continues





### INSIDE MCX

#### Signal Routing





### REDUNDANCY OPERATIONAL ASPECTS

- Maximum separation between Signal and Device • errors.
- Simple, straightforward redundancy modes
  - Operational simplicity leads to less errors.
- Less equipment
  - (IP) Switches that are not there cannot fail.



### REDUNDANCY QUALITY ASPECTS

- Rate Adapter makes sure TS is always present at modulator.
  - STBs see always Tx and TS so disturbance is minimal
- TS skew can be trimmed with TSoIP buffer set point
- Switching is VERY fast
  - MCX knows what behavior should be  $\bullet$
  - TS is reconstructed, perfectly played back internally, so • a short interruption points to a stream failure.

RF Signal is only interrupted if device fails

This is very rare ullet



### MCX7000 R2.0 Direct-to-Home with 1+1 carrier redundancy





### REDUNDANCY SCALABILITY FLEXIBILITY

- 1-4 Modulators are supported
- Scenario works also with ASI
  - Up to 6 ASI in
  - Exchange via TSoIP
- Scenario works also with ASI and TSoIP mixed
  - Some redundancy networks are mixed •
  - Exotic combinations possible •
- Scenario works fine with non-bitwise identical TSs
  - TSs coming from different redundant active muxes



### REDUNDANCY CONCLUSION

- N x (1+1) redundancy with MCX7000 (N=1 to 4) is an alternative to N+1 redundancy
- Advantages
  - Faster switching times (quasi seamless)
  - Less hardware •
- N x (1+1) redundancy with MCX7000 (N= 1 to 4) is an alternative to slotted based modulators
- Advantages
  - Faster switching times (quasi seamless)
  - Inherently simpler redundancy design (no need for • redundant management system in one rack)



### SMPTE 2022-7 Seamless Protection Switching





### Roadmap R.1 – Q1 17



### References/Use Cases Clean Channel Technology **DVB-S2X IN TODAY'S BROADCAST NETWORKS**

|   | Increase Bitrate by almost 7% without Loss of Q |   |             |         |  |
|---|---|---|-------------|---------|--|
|   | Throughput                                      | Configuration                           | Link margin | Availab |  |
| А   | 48.8 Mbps                                       | 27.1 Mbaud, 8PSK 3/5, 35%               | 4.95 dB     | 99.991% |  |
| В   | 51.8 Mbps                                       | 28.8 Mbaud, 8PSK 3/5, <u>25%</u>        | 4,60 dB     | 99.990% |  |
| С   | 52.2 Mbps                                       | 31.3 Mbaud, <b><u>QPSK 5/6, 15%</u></b> | 4,97 dB     | 99.991% |  |
| Reduce Downtime by 43% without Loss of Throug |   |   |             |         |  |
|   | Throughput                                      | Configuration                           | Link margin | Availab |  |
| D   | 49.5 Mbps                                       | 27.5 Mbaud, 8PSK 3/5, 35%               | 4.89 dB     | 99.300% |  |
| Е   | 50.0 Mbps                                       | 30.0 Mbaud, <b><u>QPSK 5/6, 20%</u></b> | 5,14 dB     | 99.600% |  |

Tested receivers do not suffer from link degradation using 10%-15% RO Assumption : receiver can handle increased baudrates and bitrates

#### **Distribution** Use Case Single carrier saturated 36MHz Measured Values

### f QoS ailability 991% 990% With predistortion 991% +1,5dB oughput ilability





#### DTH REFERENCE



#### Equalink®

- 20 DVB-S + 15 DVB-S2
- Total: 20 X 3.3 + 15 X 4.6= 135 Mbit/s
- Traffic : + 8.5%

#### Impact of Symbol Rate increase



DVB-S / QPSK 3/4

#### DVB-S2 / 8PSK 2/3



#### DTH REFERENCE





### 74 Mbps in 36 MHz

#### Hellas Sat chooses Newtec to power new DTH Earth Station

Press release • Saturday 12 September 2015

| 🖂 Mail to friend | in Share < 95 |
|------------------|---------------|
| 4                | Tweet 10      |

Contract for the multimillion EUR project was signed today at IBC2015



partnership contract at IBC2015

#### AMSTERDAM, Netherlands, and SINT-NIKLAAS, Belgium, 12 September 2015. Hellas Sat, a

subsidiary of Arab Satellite Communications Organization - the leading satellite provider in the Middle East and North Africa - today announced it has chosen Newtec's solutions to power a new multimillion Euro Direct-to-Home (DTH) earth station.

Located in Cyprus, the earth station will broadcast up to 70 TV channels, ten percent of which will be delivered in High Definition (HD). Most of the content will be received via different Television Receive-Only (satellite dishes) (TVROs) and all content will be transcoded and re-multiplexed into different bouquets, which are then uplinked via Arabsat's BADR satellites.

Newtec, a specialist in designing, developing and manufacturing equipment and technologies for satellite communications, will be the prime contractor, designer and integrator of the entire DTH earth station. It will also provide its Newtec M6100 Broadcast Satellite Modulators amongst other Newtec equipment, Ericsson TV encoding and multiplexing equipment, two 7.6m antennas and an umbrella network management system.

Hellas Sat's and Newtec's management signing their



#### **OSN chooses Newtec: Raising capacity**

#### DTH REFERENCE





### 65 Mbps in 33 MHz

"Before we could broadcast seven HD channels from each transponder, now we can broadcast nine. This means that OSN will end up having about 12 transponders and then you add 22% capacity and you have about 120 megabits at no additional cost, which is more than one and a half transponders. This means a big saving."

"We keep our existing set top boxes, existing antennas, cabling and so on. We have a higher data rate and it doesn't cost us anything"

Mohamed Said Zerari Technology specialist at Dubai-based Pay-TV broadcaster OSN.

http://www.digitalproductionme.com/article-9006-raising-capacity/1/

# QUESTIONS/REMARKS

Get in touch bepart@newtec.eu

