



# Next Generation DTT Platform



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March 6<sup>th</sup>, 2018, Nairobi

- **Next Generation DTT Platform – Part 1**

- Harmonic Corporate Overview.
- Trends, Services delivered by a DTT Platform.
- Compression codec – Performances, Evolution.
- Multiplex Generation.

- **Next Generation DTT Platform – Part 2**

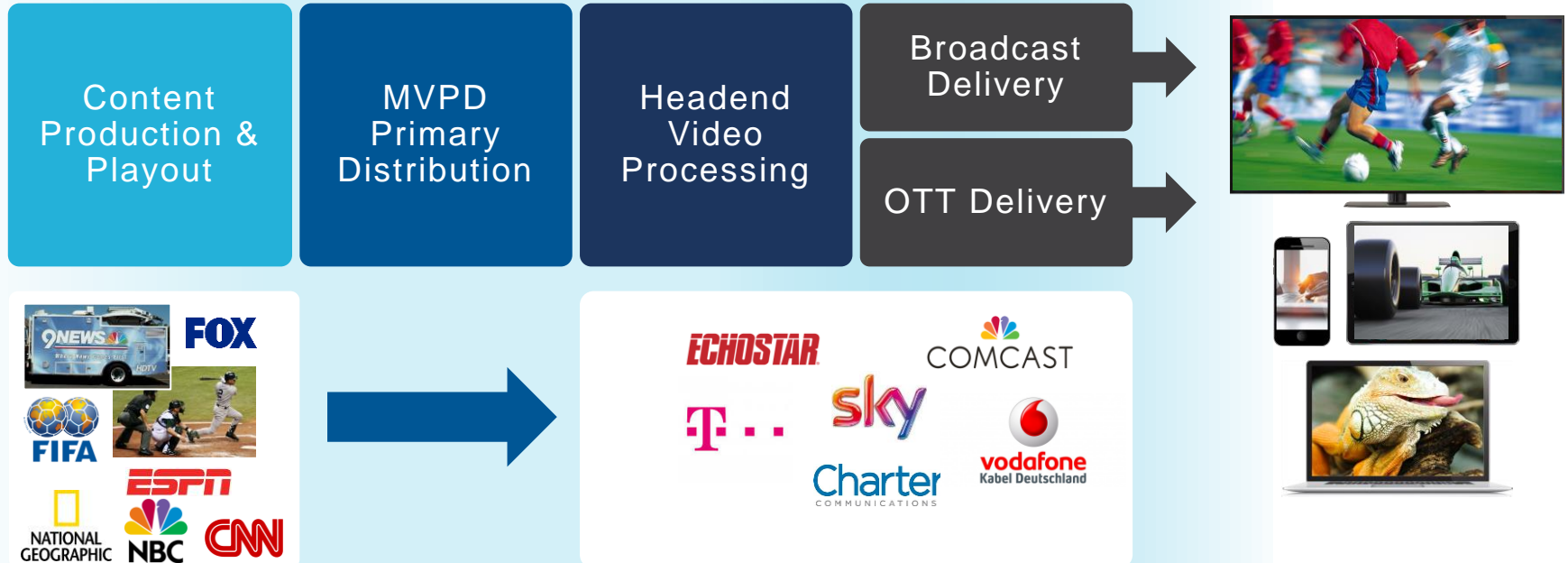
- DTT Regionalization.
- DVB Single Illumination Standard for DVB-T2+DTH.
- Offering Broadband and Interactive services.



**CORPORATE  
OVERVIEW**

**THE LEADER**  
in Premium Video Delivery and Cable  
Edge Technologies

# Harmonic Offering: Integrated Solutions Span Production to Delivery



Premium Video Transitions Driving Investment:

- Traditional Broadcast to IP / OTT
- New UHD, HDR and VR services



# Harmonic-at-a-Glance



**\$408M**

2016  
Non-GAAP Net  
Revenue

**1,300**

Employees

**GLOBAL**

10 Major Sites  
Worldwide

**>5,000**

Content &  
Service Provider  
Customers

**\$96M**

R&D Spend

# Our Customers

## BROADCAST & MEDIA

arqiva



## CABLE

COM HEM

COX



## TELCO



## SATELLITE



## MULTISCREEN



# Harmonic – The DTT Video Delivery Market Leader



- Widest DTT experience in the market
  - Since 1998
  - 63 countries, 85 projects

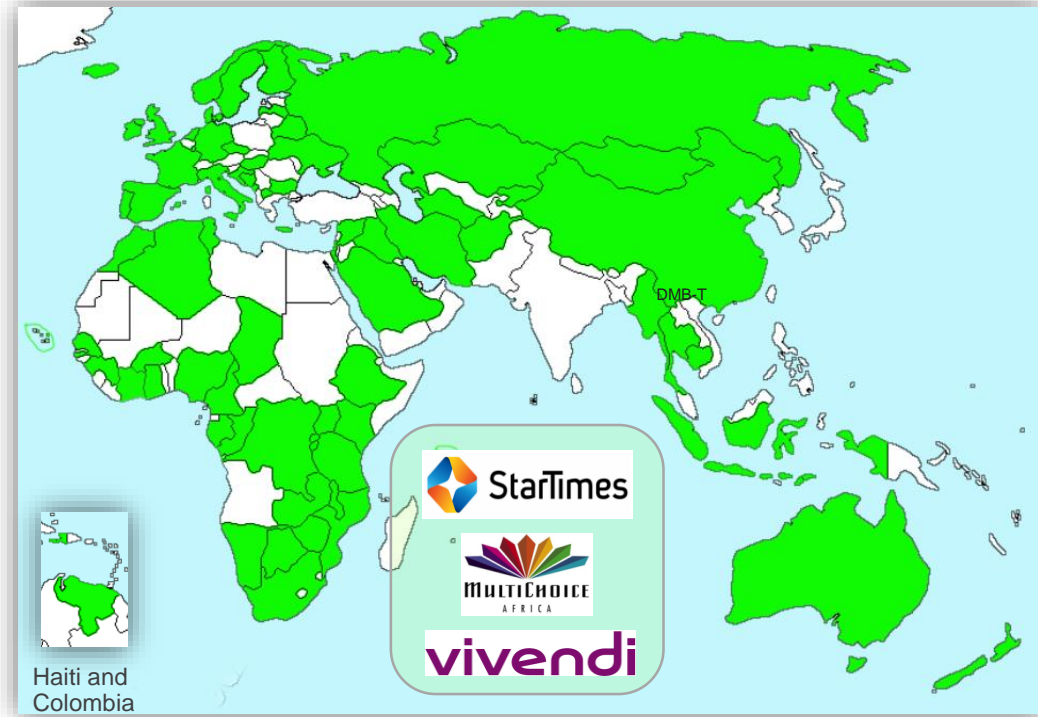
DVB-T First: 1998 (UK)

DVB-T2 First: 2010 (UK, Sweden)

HEVC/DVB-T2 First – 2015/2016

- Germany
- Seychelles
- South Africa

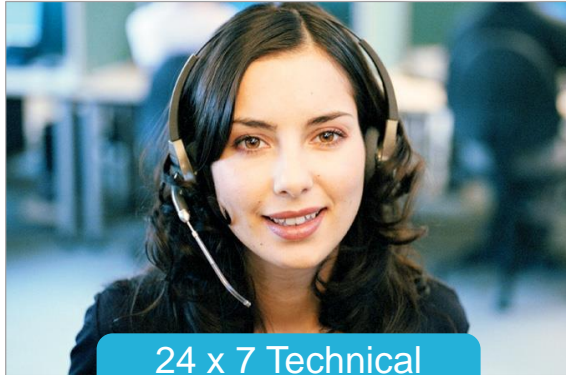
- Processing of >700 DVB-T2 multiplexes
- **90%** of our DTT projects include regionalization
- IRDs delivering video to tens of thousands of transmitters



Harmonic DVB-T/T2/DMB-T References

## GLOBAL SERVICE & SUPPORT

- Service & support plans to fit unique customer needs
- Reputation for world-class service & support
- 365 dedicated global resources
- 5,000+ customers in 110 countries on 6 continents



24 x 7 Technical Support



Regional Field Service Teams



Professional Services





**TRENDS  
SERVICES DELIVERED  
ON A DTT PLATFORM**

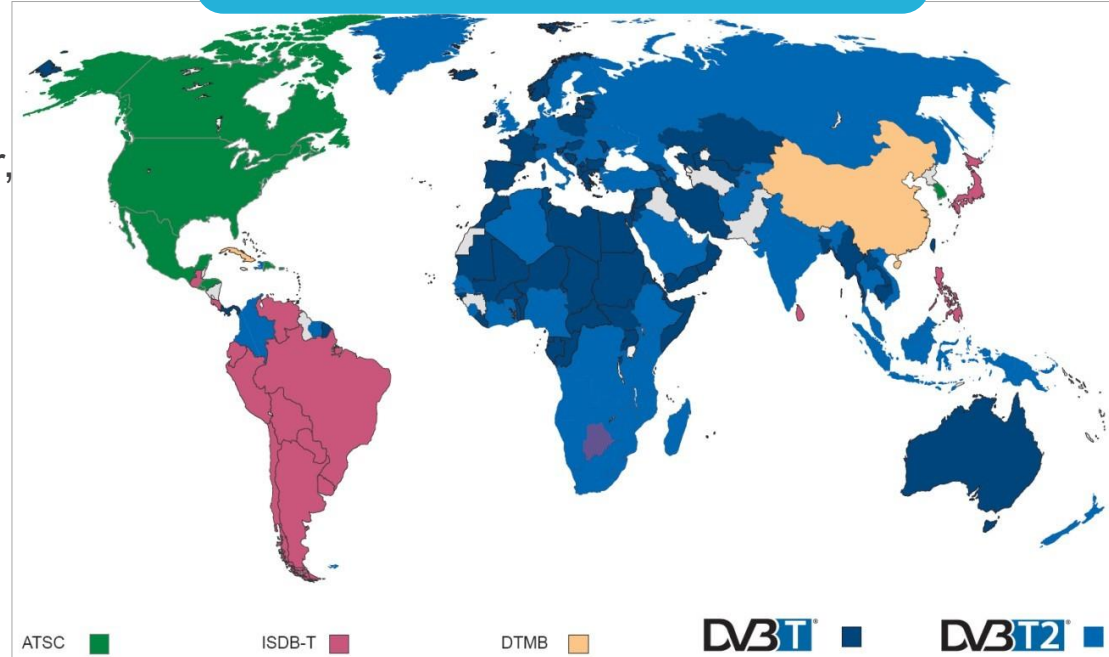
January 2018

- Government-driven ASO
- Release of 700 MHz band
- Improving the user experience: migration to HD, UHD on the radar, immersive audio codecs
- Migration to DVB-T2 & HEVC
- DVB-T2 over mobile devices
- Growing Interest for OTT
- Growing interest for Targeted Ad

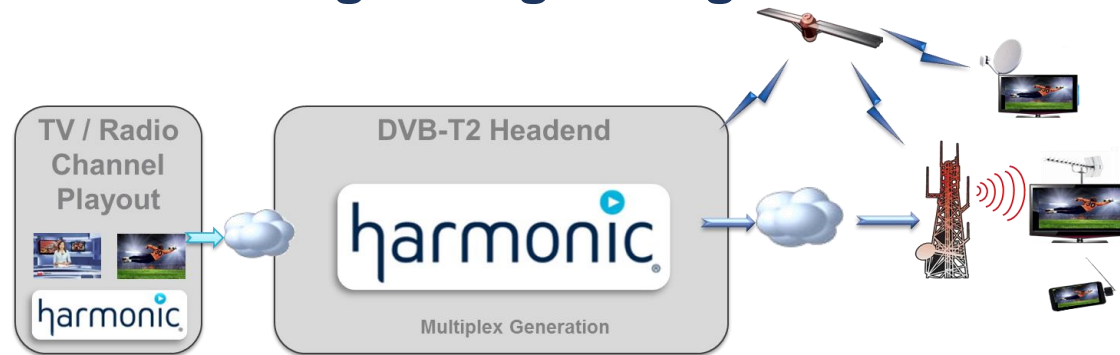
## DTT Systems – Global Deployments

DVB-T: 88 Countries (decreasing)

DVB-T2: 84 Countries (increasing)



# DVB-T2 Platform: Offering a Large Range of Broadcast Services



## National Broadcasting

- Large nb of TV services, SD, HD, UHD HDR
- Radio services
- HQ digital audio (stereo, 5.1), new: immersive 3D audio with MPEG-H and AC4
- Multi languages
- Subtitle, EPG
- PayTV, Free to air, Free to view
- Reception on portable devices
- Covering white space with DTH+DVB-T2

## DTT Regionalization

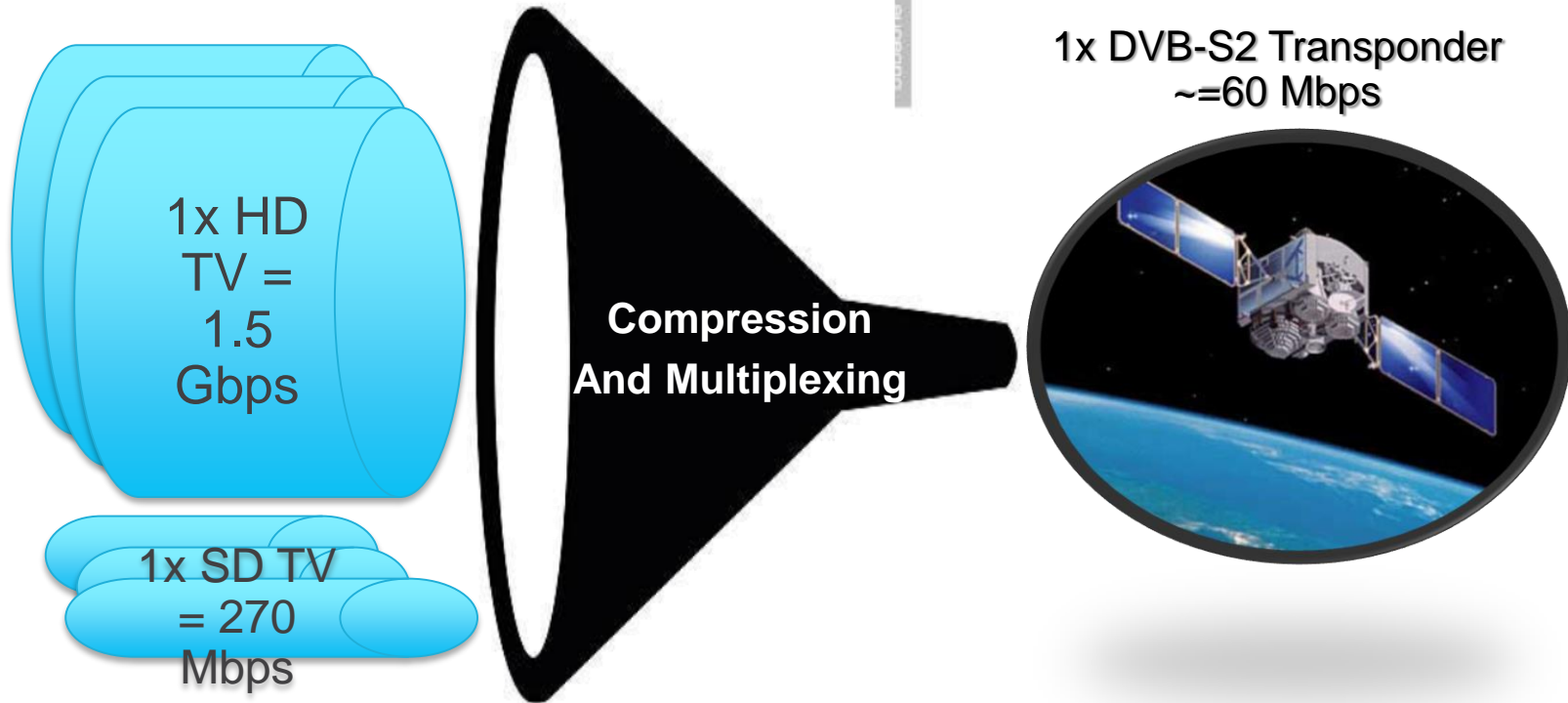
- 24/7 regional TV channel insertion
- Regional Variation
- Advertising Substitution



# **VIDEO COMPRESSION CODECS – PERFORMANCE & EVOLUTION**



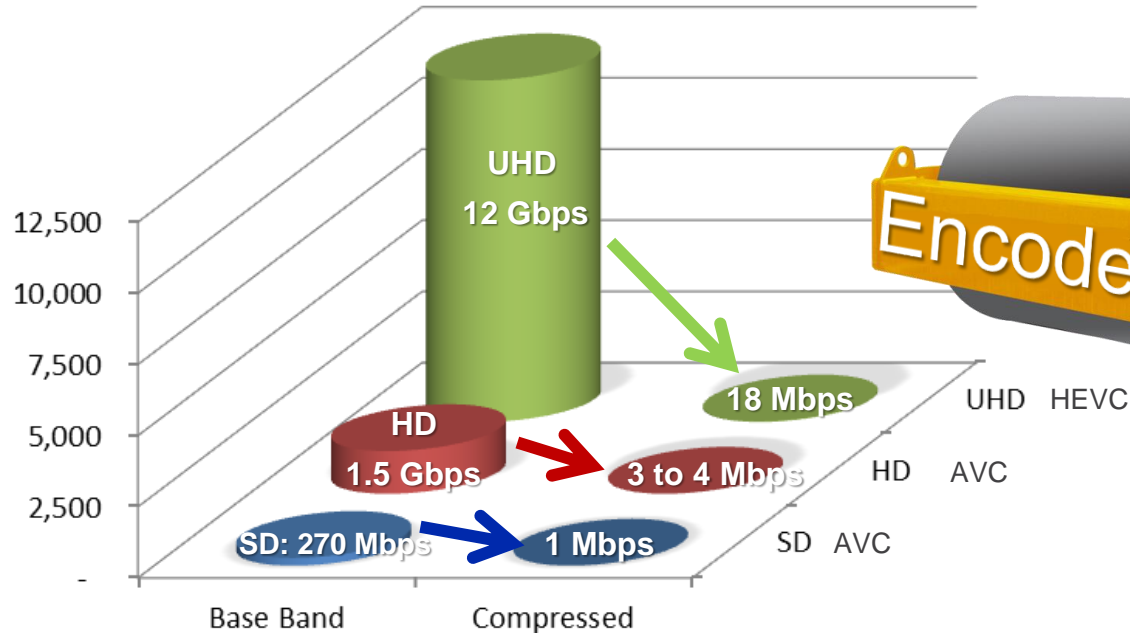
# Why to Compress Digital TV Signals ?



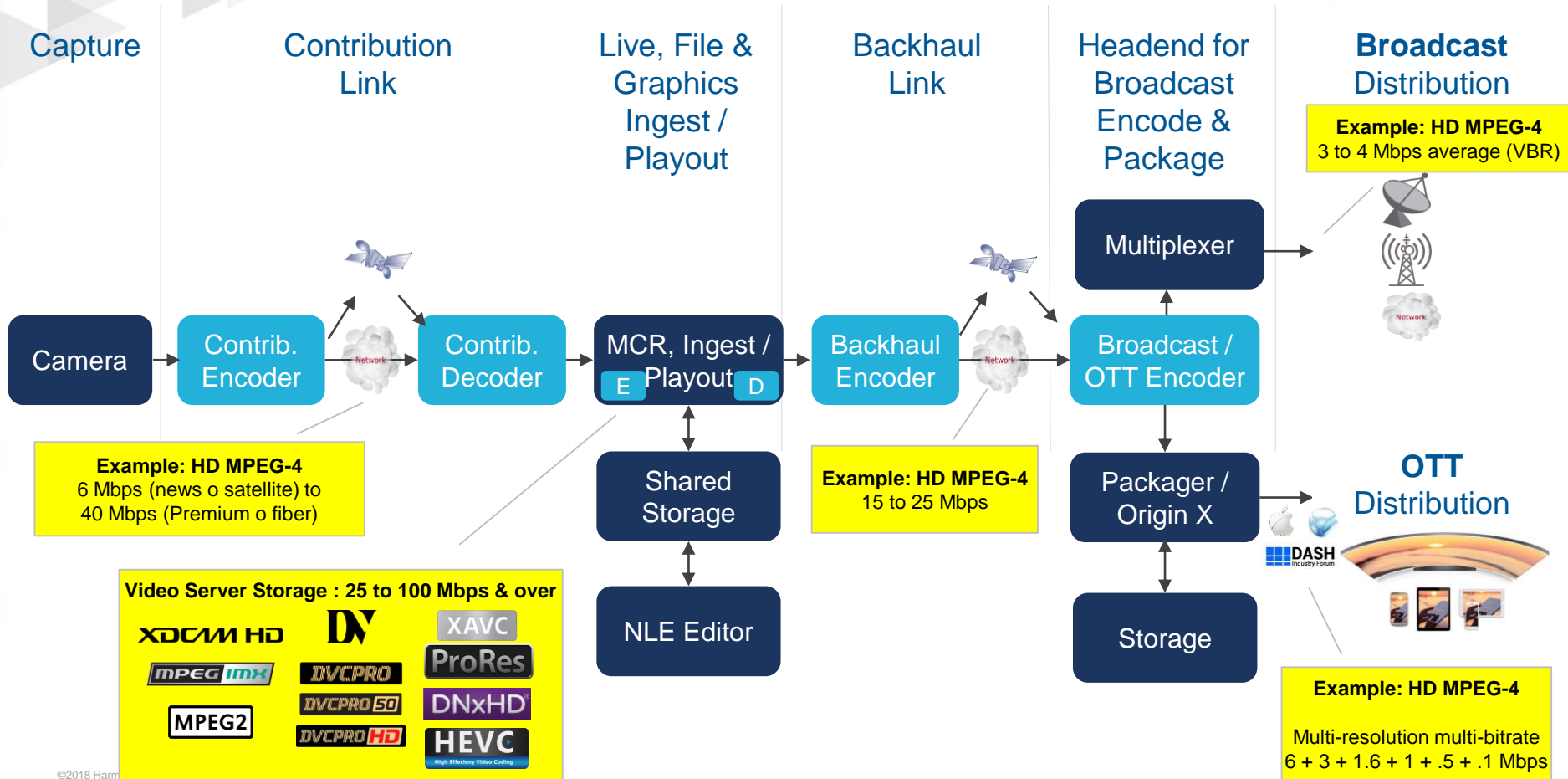
Impossible to fit even 1x SD TV in a 36 MHz satellite transponder or a 8 MHz DTT RF channel without compression

# What is an Encoder for Broadcast/OTT?

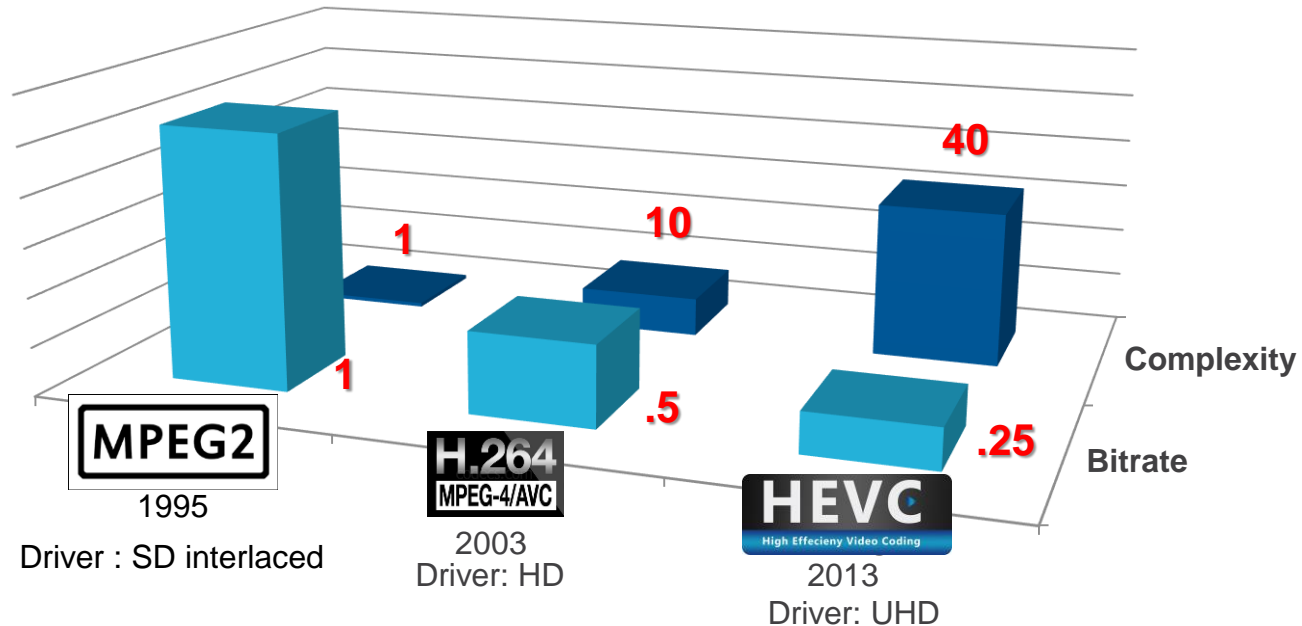
- Real time or off line compression of audio and video to fit in 8MHz RF channel
- Squeezing the bitrate to fit in transmission mediums
- Complementary services (data injection, logo insertion, ...)



# Encoders Required all Along the DTV Chain



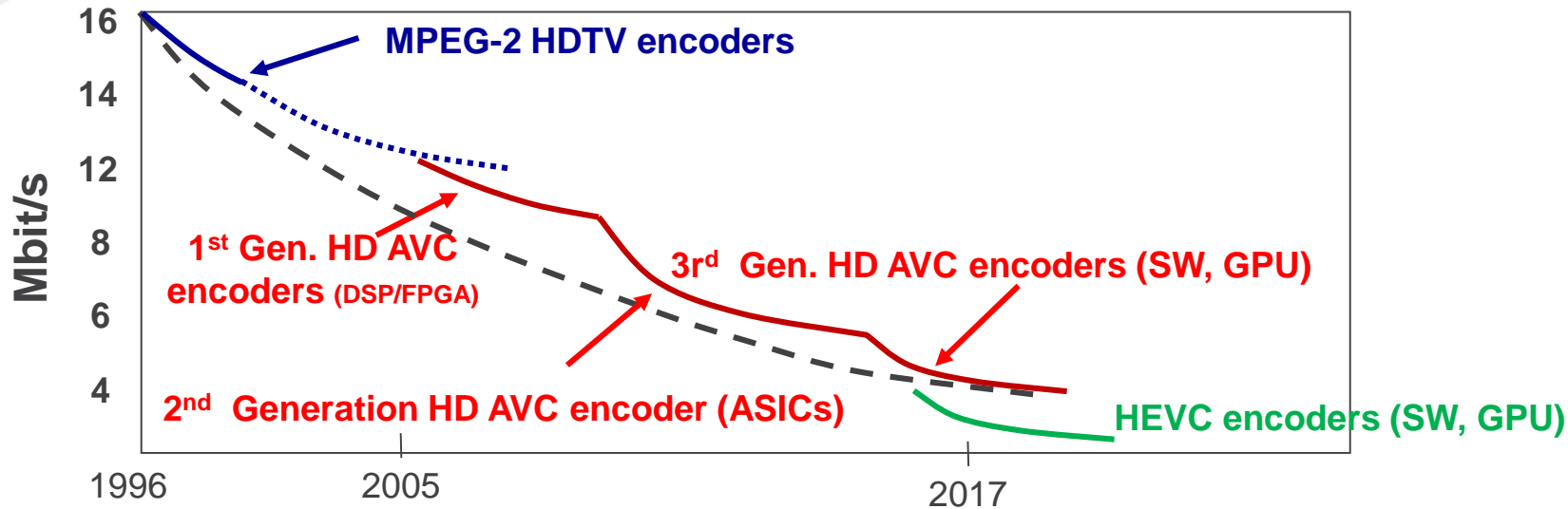
# Video Compression Standards for Broadcast



- Video compression standards are « enablers » of quality improvement
- Compression gain x2 from one generation to the other
- Encoder huge complexity increase from one generation to the other



# Encoders are Improved over Time



- During a video compression standard life, improvements are significant.
  - VQ difference between 2 SW releases of the same encoder / same standard can be huge.

# HEVC Deployment is on going

## UHD

2017 --70  
Unique linear  
UHD channels  
worldwide

2020 - 250+  
linear UHD  
channels  
expected

## Satellite Pay-TV Greenfield Projects

- DishHD on AsiaSat4
- StarTimes Africa
- Medianet HITS Maldives
- Tricolor TV on Eutelsat 36E

## DVB-T2 Deployments & Trials

- Germany: on air, official launch 3/17
- Seychelles: deployed
- Czech Republic: in deployment
- South Africa: Multichoice, Pay-TV trial
- Poland: testing
- Multiple other candidates
- Harmonic > 15 HEVC DTT references

## OTT

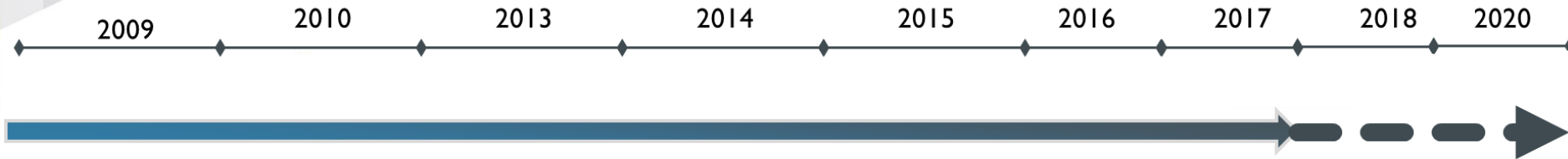


- Makes HEVC mandatory in 2017
- 180-channel global SVOD service

## HEVC Consumer Devices are Available



# Techno Trends for DVB-T2 / DTH Applications



A collection of logos for standard definition and high definition television technologies. On the left, the SDTV logo (Standard Definition Television) is shown above MPEG2 and H.264/MPEG-4/AVC logos. On the right, the HD TV logo is shown above H.264/MPEG-4/AVC, DVB S2, and DVB T2 logos. The HbbTV logo is at the bottom.

Video Resolution

Compression

Satellite Transport

DTT Broadcast

Broadcast & Broadband

A collection of logos for high definition television technologies. At the top is the 1080P Full HD logo. Below it are HEVC (High Efficiency Video Coding), DVB S2, and DVB T2 logos. The HbbTV logo is at the bottom.

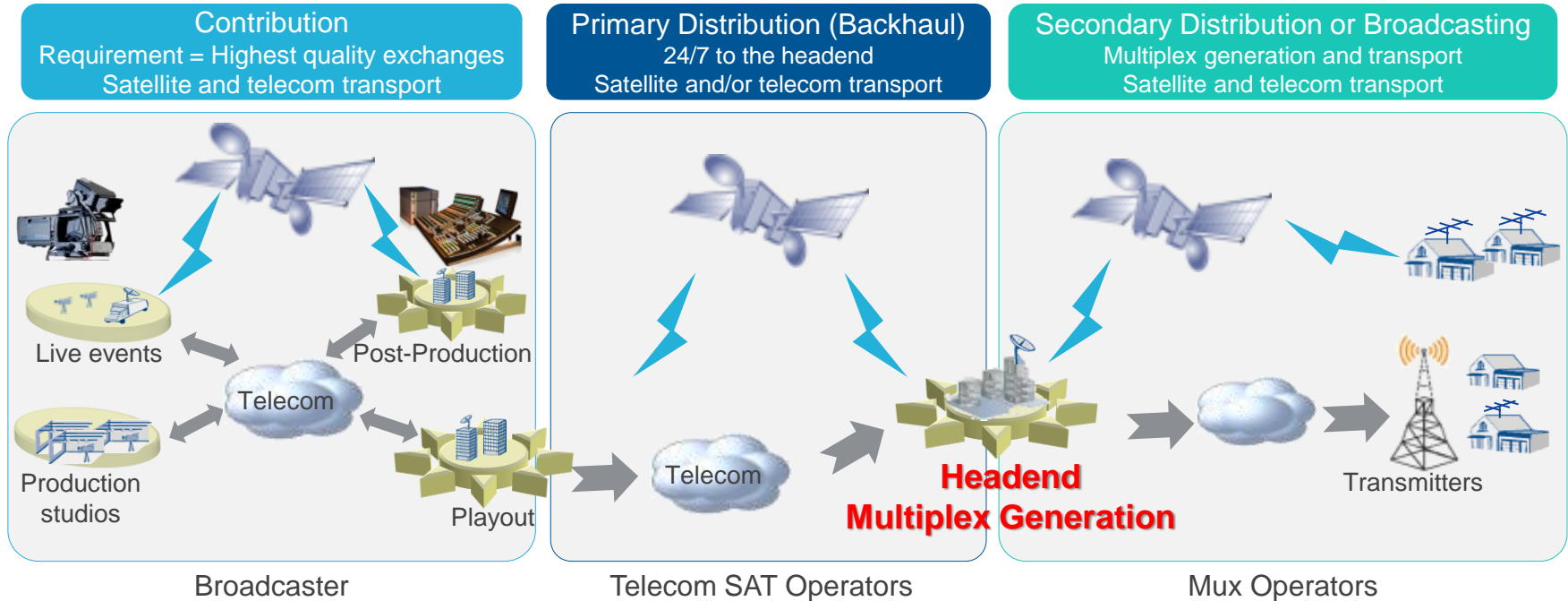
A collection of logos for ultra-high definition television technologies. At the top is the 4K HDR logo. Below it are HEVC (High Efficiency Video Coding), DVB S2X, and DVB T2 ATSC 3.0 logos. The HbbTV logo is at the bottom.



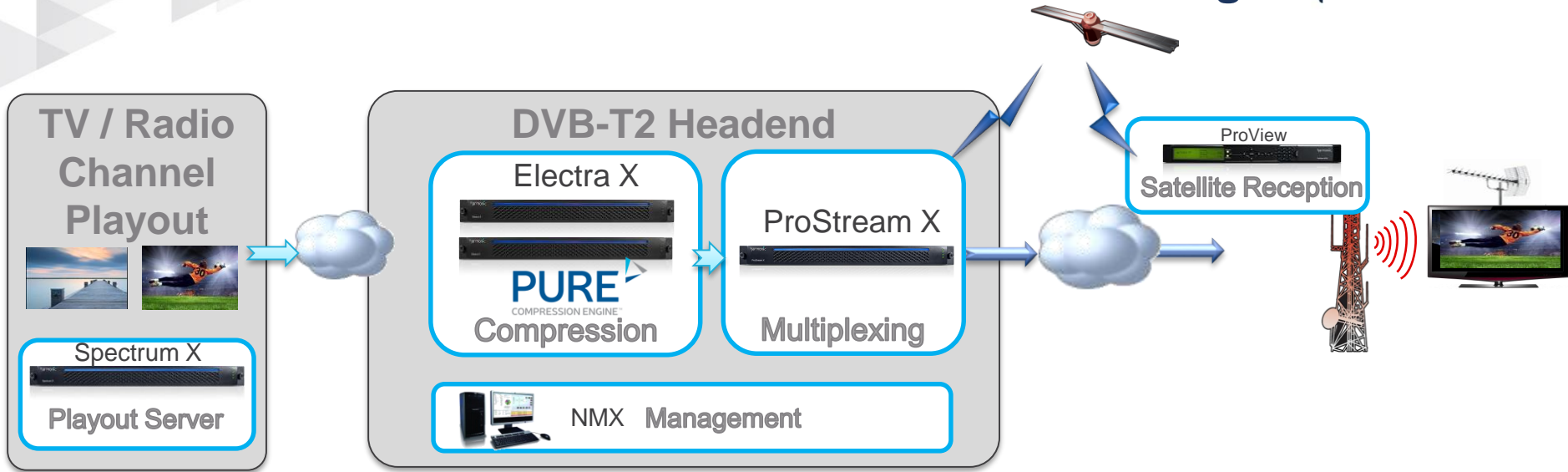
# NATIONAL HEADEND – MULTIPLEX GENERATION



# DVB-T/T2 System Overview

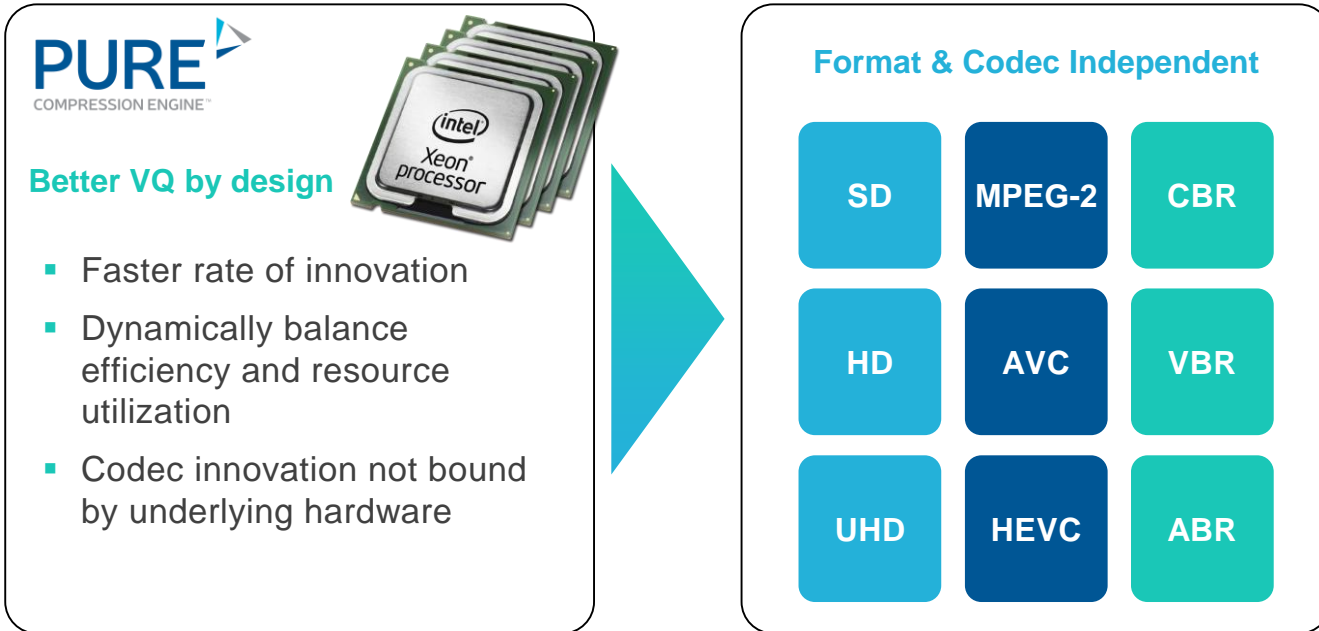


# Harmonic Solution for DVB-T2 Premium Broadcasting



- Premium compression (MPEG-4, **HEVC**) for SD, HD, UHD
- > 30 TV services per DVB-T2 multiplex
- Reliable & secure IP infrastructure (SMPTE 2022-1, SMPTE ST 2110)
- Full interoperability with Transmitters, TV and STB
- Turnkey solutions, fast deployments

# PURE Software Compression Engine



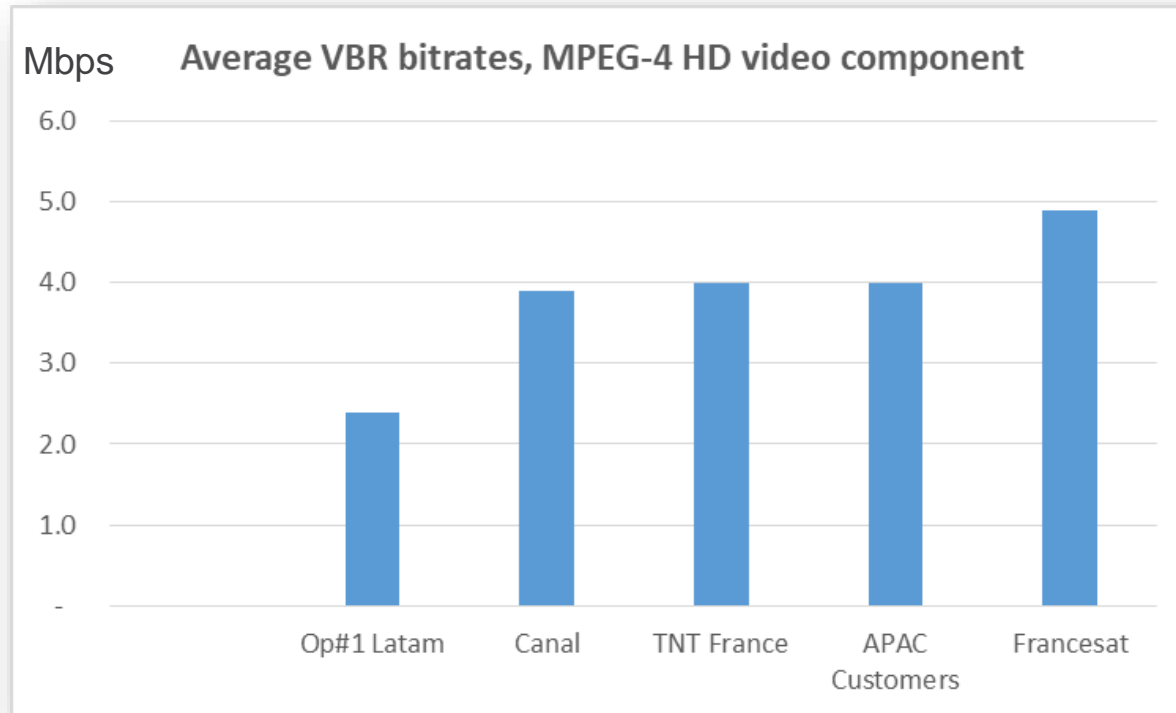
Appliance

VM, Docker

Cloud

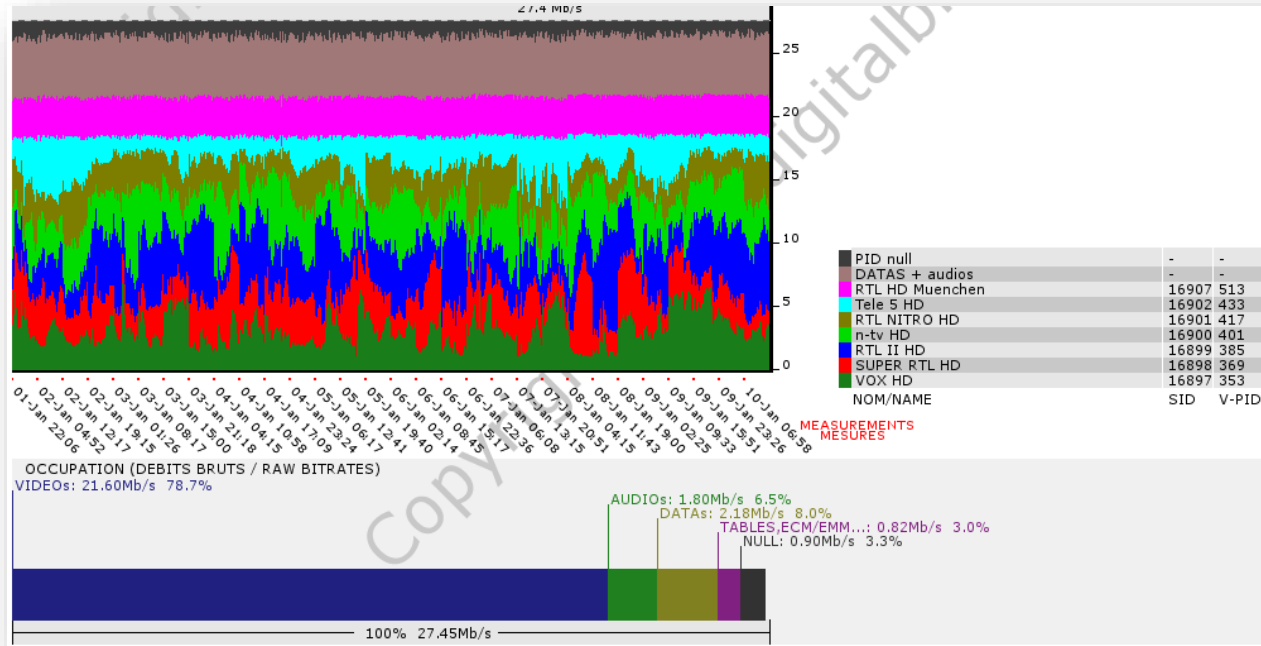
# Some HD MPEG-4 Examples

- The bitrate depend on the encoder SW release and the customer VQ expectations



# HEVC Bitrate Example: German DTT

- Full HD HEVC encoding. Average **3.0 Mbps**.
- 7 channels in a 21.6 Mbps video pool





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- Offering Broadband and Interactive services.



# DTT REGIONALIZATION

## 24/7 Regional Insertion / or Full Regional Mux

- Permanent insertion of regional TV channels to a national multiplex
- Or broadcast of a 100% regional TV channels

## Regional Variation

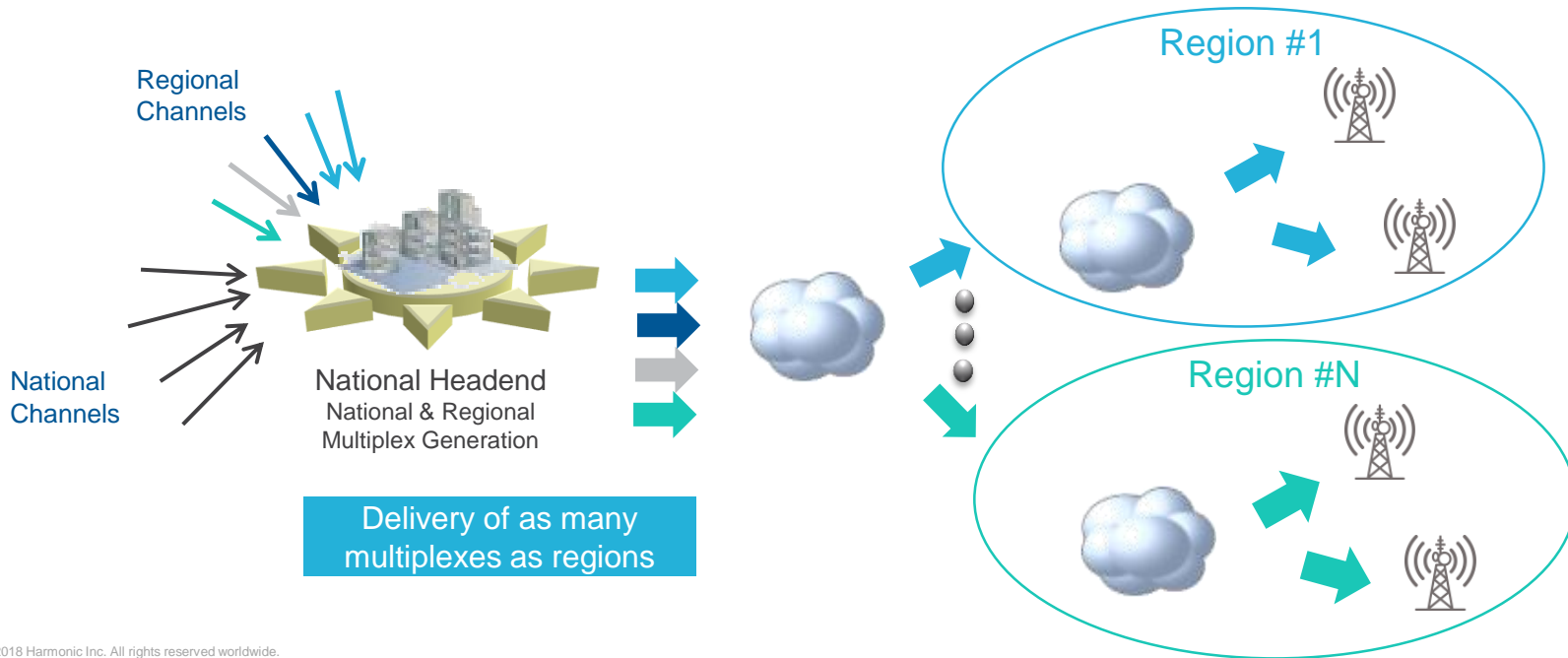
- Provides part-time programs that meet local news and entertainment expectations (sport, weather, politics, etc.)
- Typically shown twice daily

## Regional Ad Insertion

- Substitution of national advertising by regional ones
- TV channels improve their income with targeted local advertising and sponsorship tailored to local markets

# Centralized Regionalization Architecture

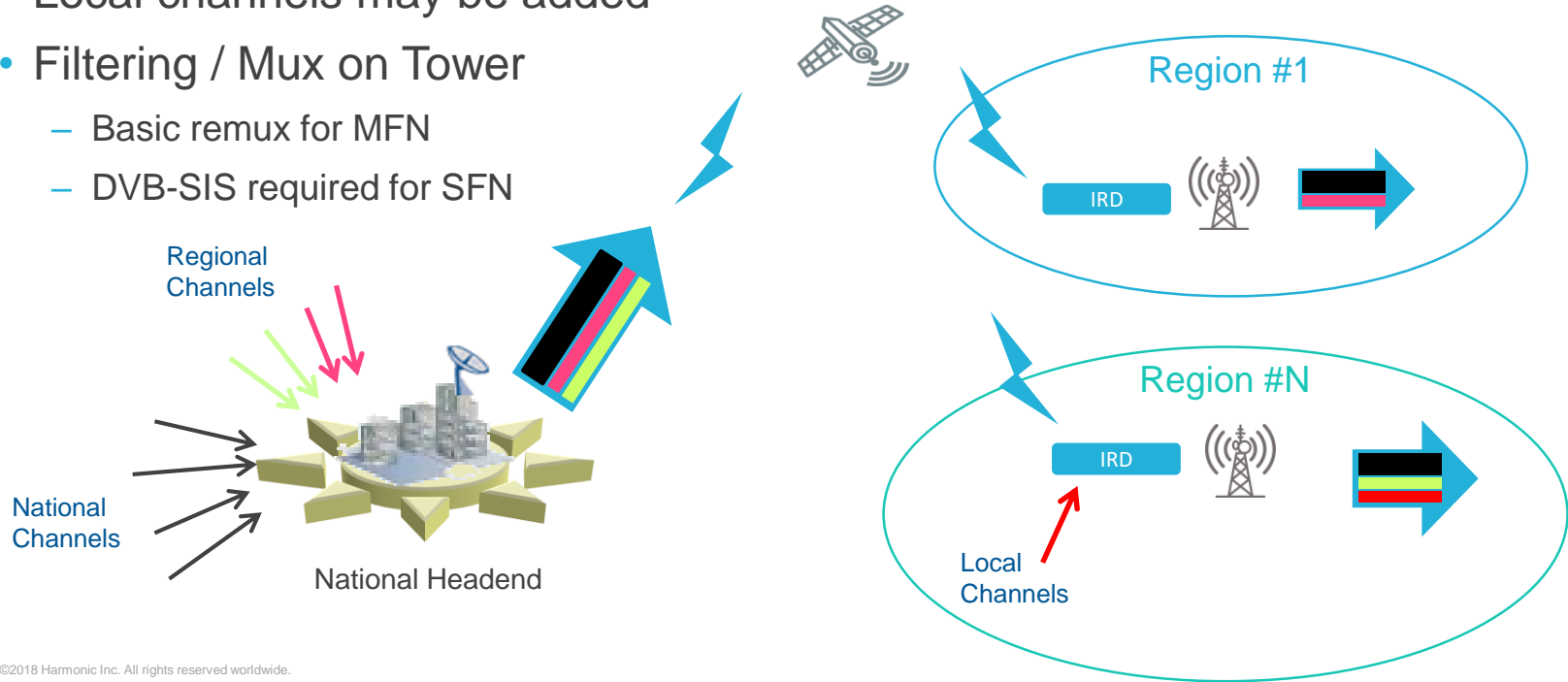
- All channels are available in the central headend
- All multiplexes are generated in the headend and delivered to regions





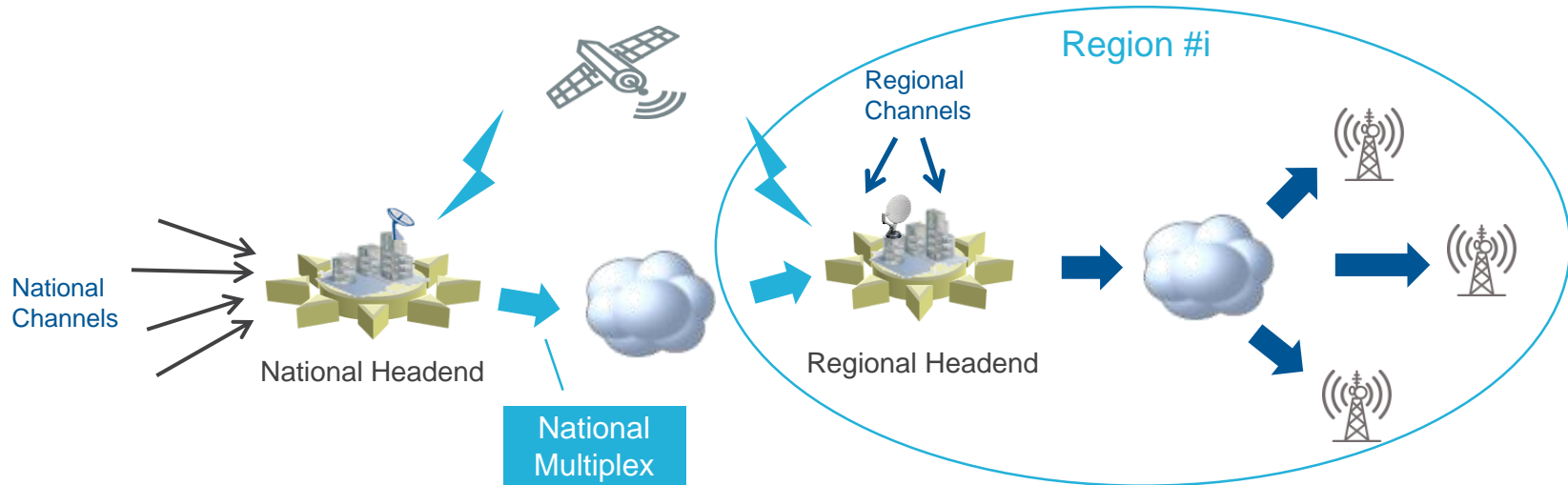
# Distributed over DTT Towers Regionalization Architecture

- All national & regional channels are available in the central headend
- Local channels may be added
- Filtering / Mux on Tower
  - Basic remux for MFN
  - DVB-SIS required for SFN



# Distributed over Regions Regionalization Architecture

- Regional content processed in the regional headends



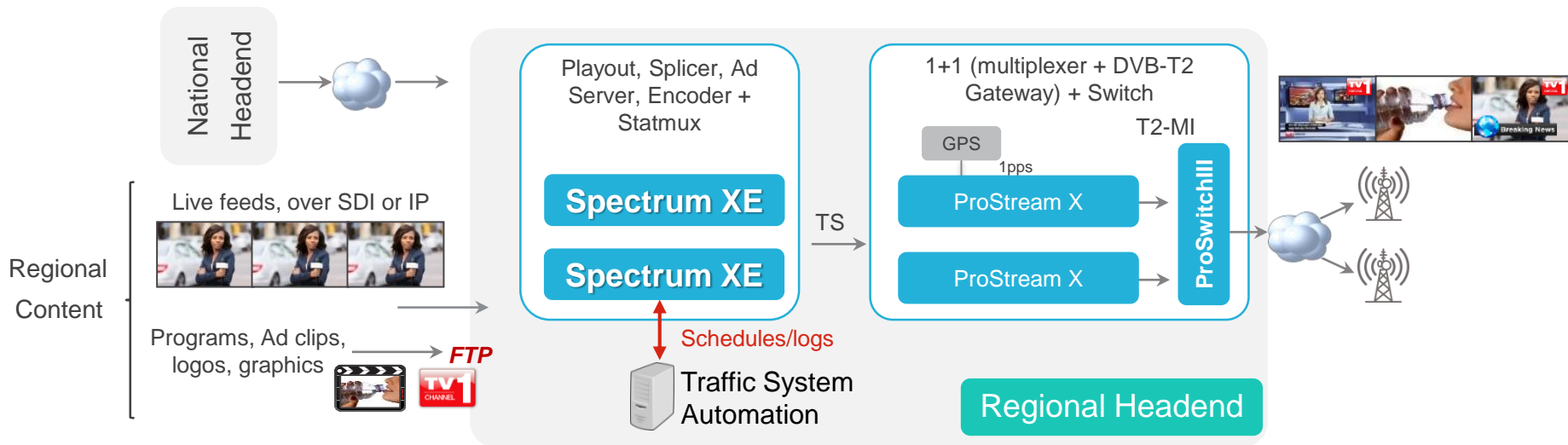
# Spectrum XE - Payout Server for Advanced Regionalization

Playout of  
Regional TV

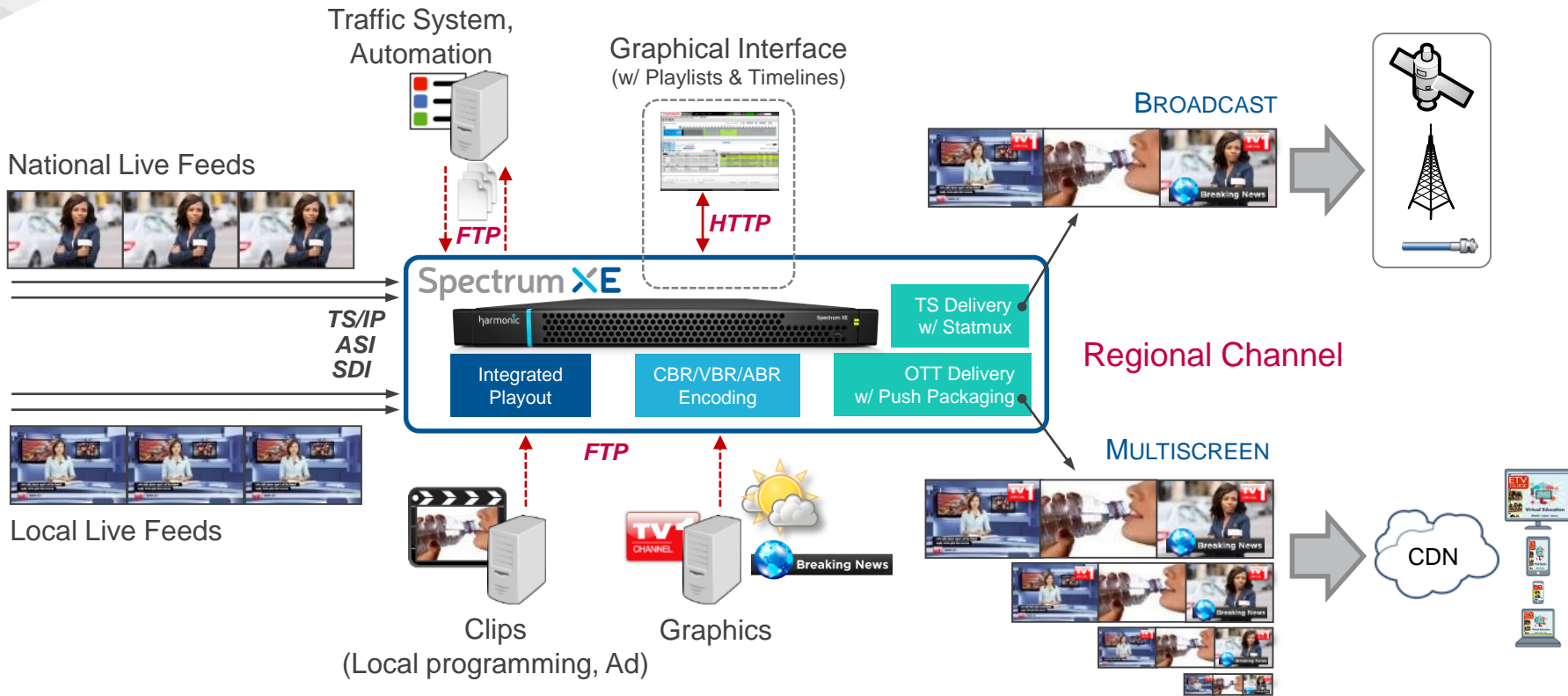
24 / 7 Insertion

Regional  
Variation

Ad Insertion



# Spectrum XE - Playout Server for Advanced Regionalization harmonic



**Up to 12 SD or 3HD channels per Spectrum XE**

The Harmonic logo, featuring the word "harmonic" in a lowercase, sans-serif font. A small blue play button icon is positioned above the letter "i".

harmonic

The title text, "DVB-SIS Single Illumination Standard for DVB-T2 + DTH", is displayed in a bold, dark blue, sans-serif font. It is positioned on the left side of the slide, partially overlaid by a large, semi-transparent blue geometric shape that tapers to a point on the right.

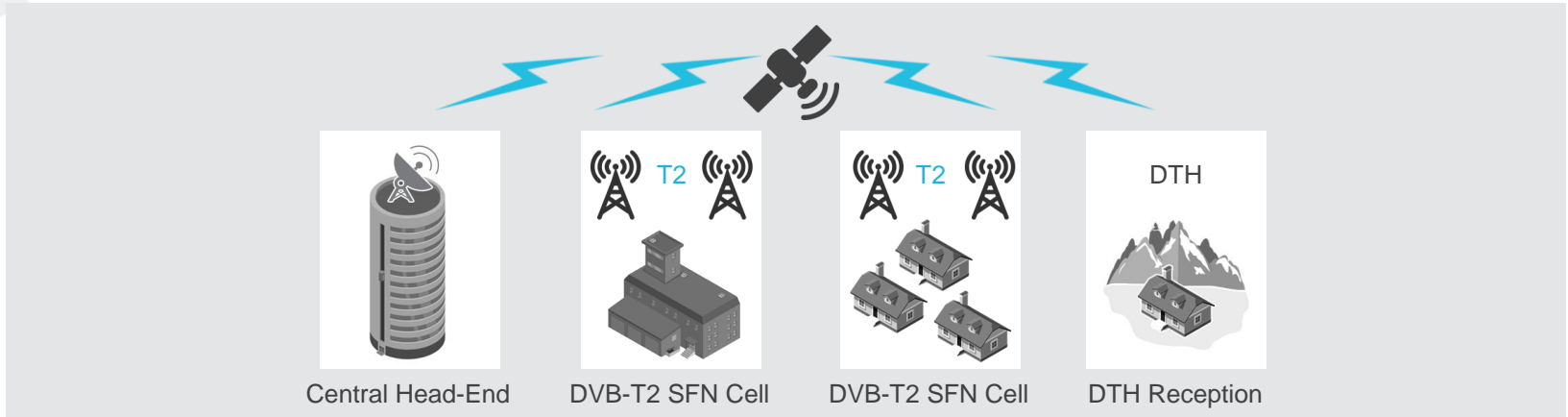
**DVB-SIS Single  
Illumination Standard for  
DVB-T2 + DTH**

The DVB-SIS logo, where "DVB" is in a bold, black, sans-serif font and "SIS" is in a bold, white, sans-serif font inside a blue rectangular box. The logo is centered on the right side of the slide.

**DVB**SIS



# A Single Illumination for DTH and DVB-T/T2 Transmitters



Delivery of a multiplex in the form of a single DTH stream to:

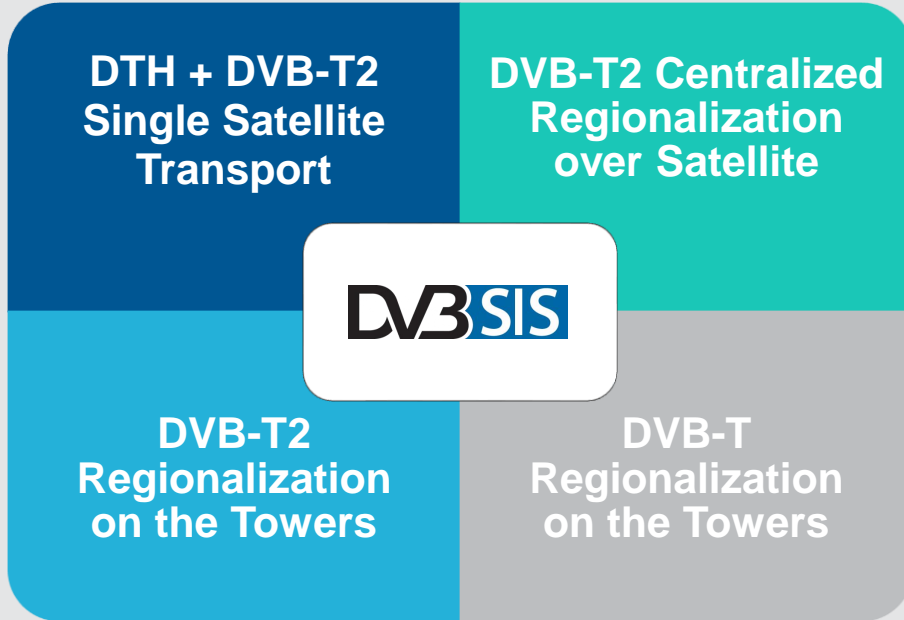
- DVB-T2 transmitters, organized into SFN cells
- Regular DTH STB in areas where the terrestrial coverage is difficult or even impossible

## Benefits

- Mutualize satellite transmission for DTH+DVB-T/T2
- Send each TV service only one time → saves on OPEX and a lot of CAPEX

*Proprietary Solutions. Strong needs but few deployments. The standard will boost the market.*

# Goal of the DVB Single Illumination DTH/DVB-T2 Standard



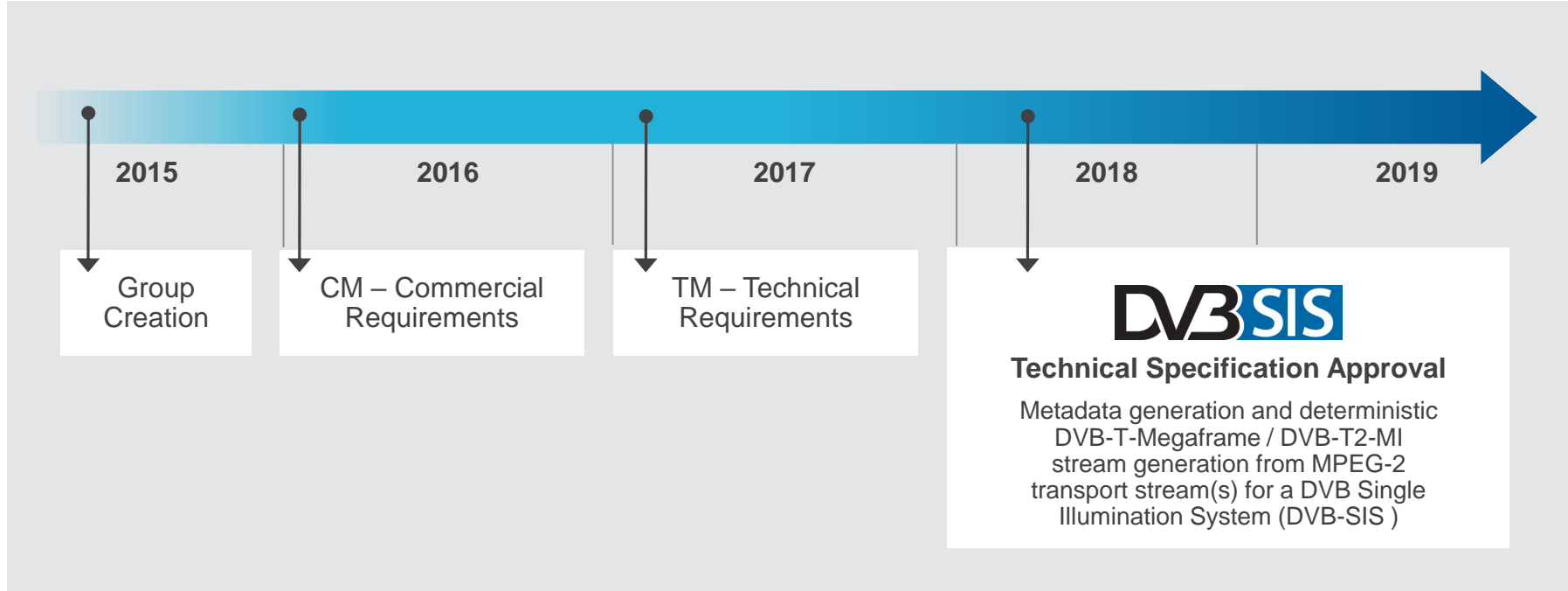
*Collapse all these targets in a single standard*

Draft ETSI TS jsi jsi V1.1.1 (2017-11)



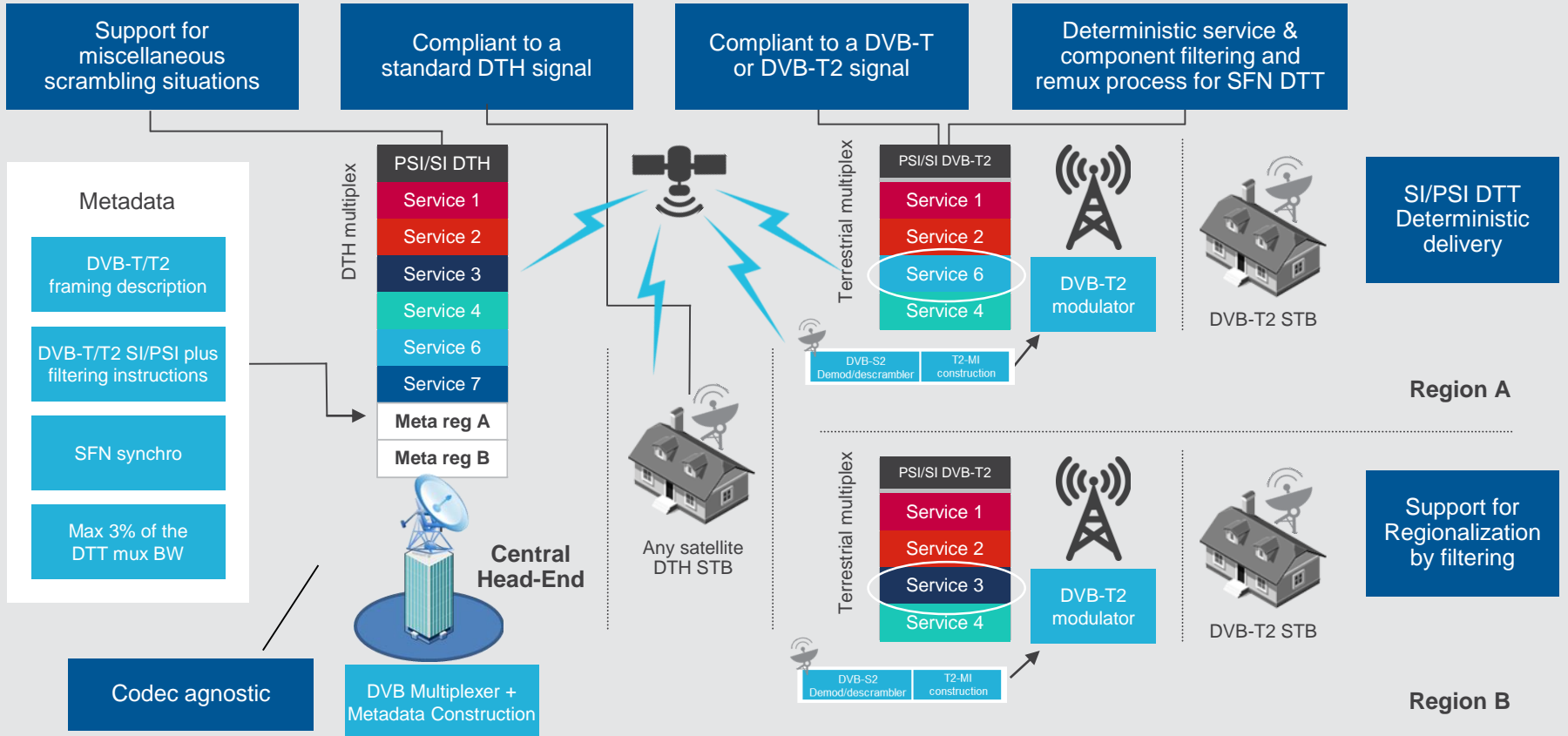
Digital Video Broadcasting (DVB);  
Metadata generation and deterministic DVB-T-Megaframe/DVB-  
T2-MI stream generation from MPEG-2 transport stream(s) for  
a DVB Single Illumination System (DVB-SIS)





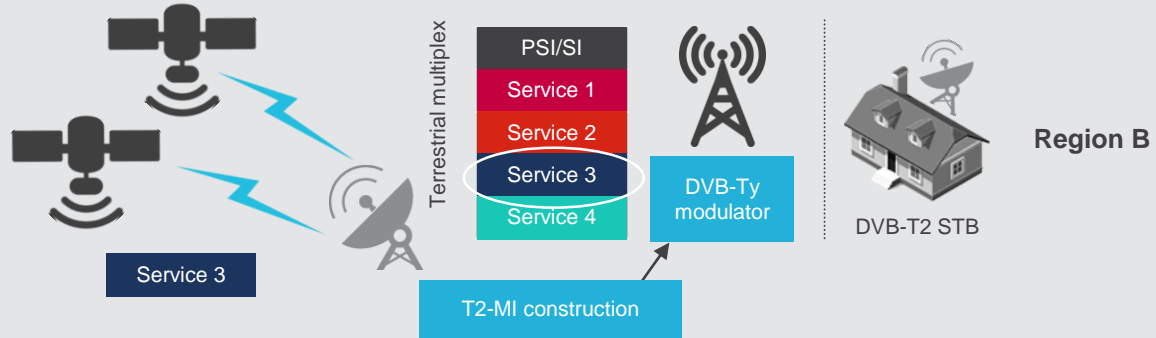
*The standard will be released by ETSI in a few months*

# Standard Main Requirements

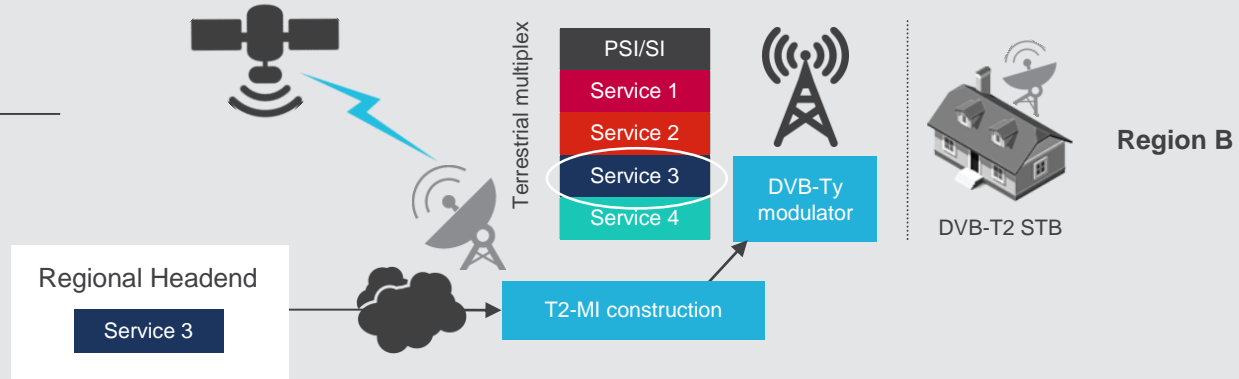


# Standard Main Requirements: Regionalization on Tower

Capability to deterministically rebuilt a DVB-T/T2 signal from multiple satellite feeds

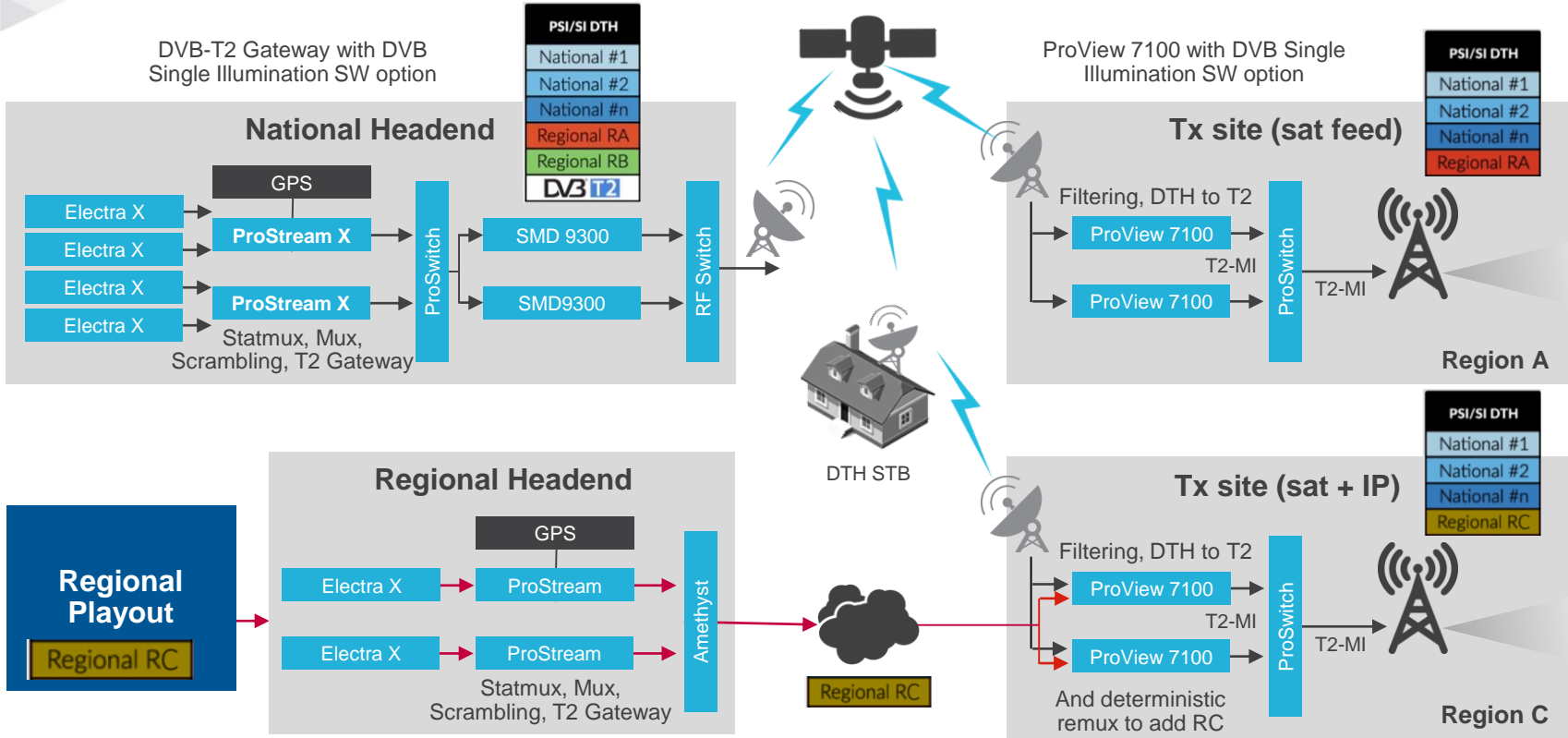


Capability to deterministically rebuilt a DVB-T/T2 signal from an hybrid reception





# Harmonic Solution for the DVB Single Illumination Std



Same architecture as a regular DVB-T2 Platform

DVB-SIS

## ProStream X Single Illumination Gateway

- DVB-T2 Gateway SW option of NetProcessor ported in ProStream X as SW option.
- Supports DVB-SIS metadata generation.
- Plus all the features of ProStream X!



## ProView 7100 DVB Single Illumination IRD

DVB-SIS

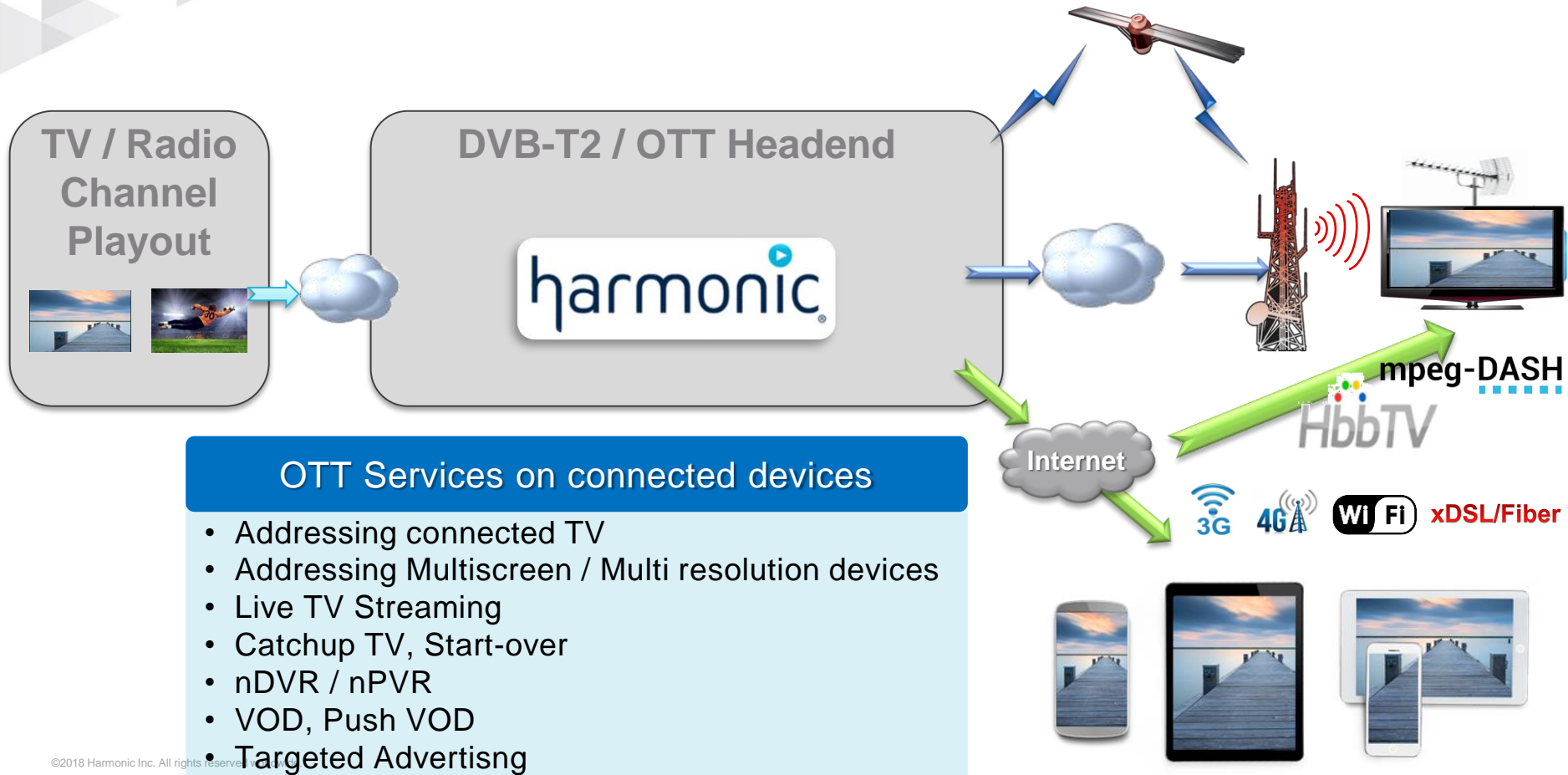
- DVB-SIS metadata processing
- Multiple RF, IP and ASI feeds
- Plus all ProView 7100 features!



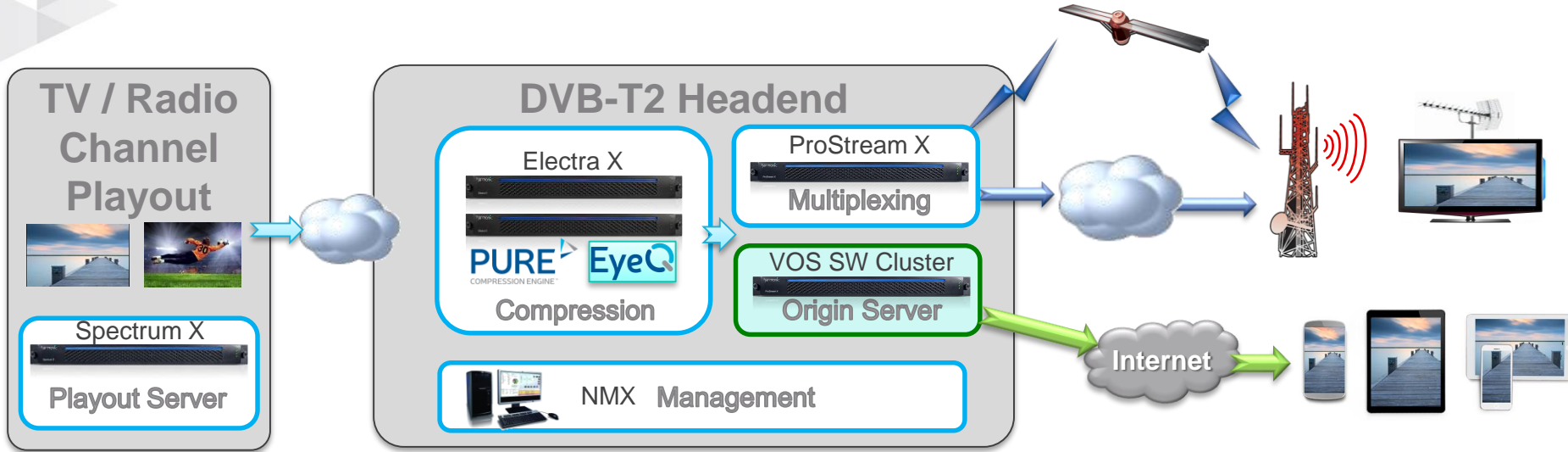


# OFFERING BROADBAND AND OTT SERVICES

# Hybrid DVB-T2 / OTT Platform: Offering Broadband TV Services



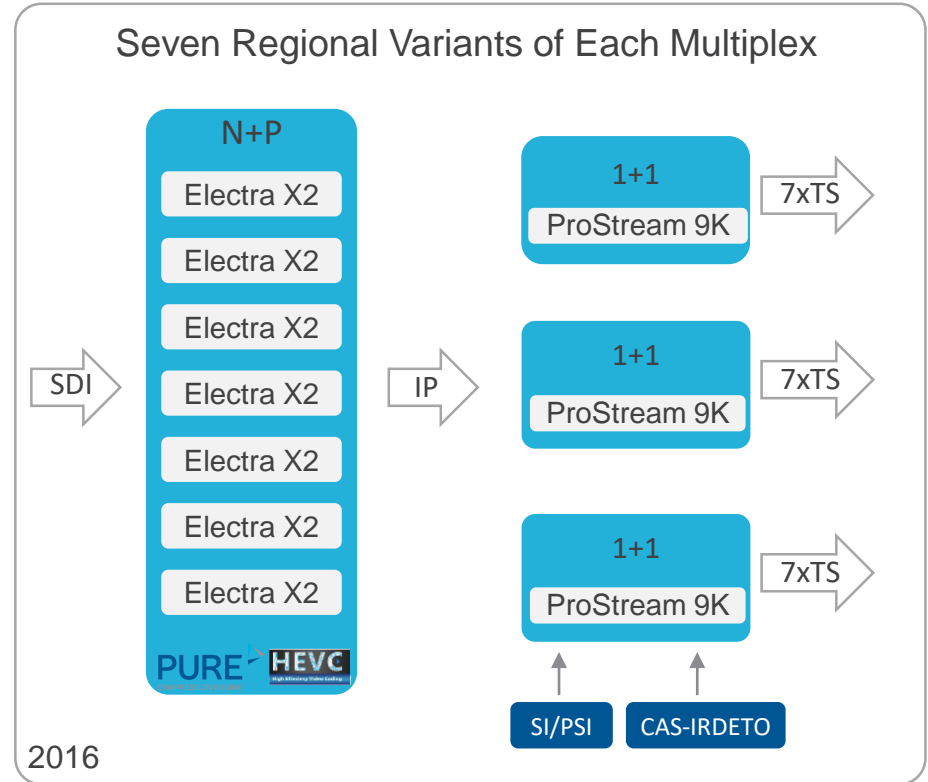
# Harmonic Solution for DVB-T2 / OTT Platform



- Addon to the DVB-T2 headend on to deliver OTT services: Streaming, Catchup, VOD, ..
- Premium compression (MPEG-4, HEVC), EyeQ for 50% cost cut on video streaming
- Support for all major IP streaming and DRM protocol standards (PayTV for OTT)
- High interoperability with the device video Application players
- Highly scalable




# Germany Case: DTT Migration to Full HD/DVB-T2/HEVC

- Migration from T to T2 to offer more channels and HD
- Multiplex limited to 18-27Mbps for better indoor and mobile coverage
- PURE HEVC VQ was key to win project
  - SD up-scaled to 960x540P50 (qHD)
  - HD up-scaled to 1080p50
- Regionalization is key in all projects:
  - DiviTrackIP Remote regional statmux
  - HEVC splicing
- Remote Statmux
  - Save latency, video quality, backhaul codec
- Multiplex configuration:
  - 27Mbps TS, ~20Mbps VIDEO
  - 6-7 FHD channels @1080P50
  - Or 6 FHD @1080P50 + 3 qHD





# Germany Case: Complementary Broadcast Services to connected TV from the DTT Headend

-   (DVB-T and DVB-S) and  (DVB-T2)
  - Hybrid TV, FTA portal
  - A single EPG for Broadcast and Broadband Linear services
  - All delivered on the connected TV
  - HbbTV standard technology inside
- Headend for IPTV and Cable operators
  - DTT and DTH content adapted to IPTV and delivered to multiples ISPs
  - Similar action to Cable operators

The background of the slide is a photograph of a beach at sunset. The sun is low on the horizon, creating a bright orange and yellow glow that reflects on the wet sand. The sky is filled with soft, colorful clouds. In the foreground, gentle waves are washing onto the shore. A large, semi-transparent blue geometric shape, composed of overlapping triangles, is overlaid on the left side of the image, pointing towards the center.

# CONCLUSION

On going migration to DTT in the world, most including regionalization.

Techno trends: UHD HDR, new immersive 3D audio, DVB-T2, DVB-S2, HEVC, DVB-SIS, “all IP” infrastructure.

OTT is a big concert for all players of the video service delivery community. Broadcasters and DTT operators start deploying.

Harmonic's offer technical solutions and support for any video delivery application.

THANK YOU



# Audio Compression for Broadcast - Codecs

| Audio Codec                | Stereo | Surround 5.1 | Patent | Comment  |
|----------------------------|--------|--------------|--------|--|
| Uncompressed               | X      | X            |        | Used in some contribution cases  |
| MPEG-1 Layer 2             | X      |              |        | Less efficient audio codec, x2 AAC LC bitrate.   |
| MPEG-2/4 AAC LC            | X      | X            | X      | Transparent audio quality at a typical bitrate of 128 kbit/s   |
| MPEG-4 HE AAC V1           | X      | X            | X      | Spectral Band Replication (SBR), 50% bitrate reduction.  |
| MPEG-4 HE AAC V2           | X      | X            | X      | Parametric Stereo (PS). Useful at the lowest bitrates (approx. 16 - 48 kbit/s) to give a good stereo impression  |
| MPEG-H part 3 - 3D Audio   | X      | X            | X      | 2015. Immersive audio codec. Offers audio objects that enable interactivity or personalization by viewers. Selected in Korea for UHD.  |
| AC-3 (Dolby Digital)       | X      | X            |        |  |
| E-AC3 (Dolby Digital Plus) | X      | X            |        | vs AC-3: wider range of data rates (32 Kbit/s to 6144 Kbit/s), increased channel count and multi-program support, enhanced compression efficiency.   |
| Dolby AC4                  | X      | X            | X      | 2015. 75% reduction in bit rate over Dolby Digital Plus. Loudness control. Enhanced dialog clarity. Atmos immersive audio experiences. Viewers can customize their audio. Recommended for ATSC3.0. |

# Global Presence

● Corporate / Regional HQ / R&D Locations    ● Sales & Services Support Centers

